EDISON
Electric Institute
BULLETIN

JULY, 1935

STATISTICAL DATA OF THE ELECTRIC LIGHT AND POWER INDUSTRY

Compiled Monthly by the Edison Electric Institute—Covers 100% *of the Industry*

DURING THE MONTH OF APRIL (Preliminary Report)

	1935	1934	%
Kilowatt-hours Generated* (Net)			
By Fuel	3,944,880,000	3,700,034,000	+ 6.6
By Water Power	3,347,020,000	3,194,637,000	+ 4.8
Total Kilowatt-hours Generated	7,291,900,000	6,894,671,000	+ 5.8
Additions to Supply			
Energy Purchased from Other Sources	186,495,000	208,847,000	−10.7
Net International Imports	66,989,000	45,617,000	+46.9
Total	253,484,000	254,464,000	− 0.4
Deductions from Supply			
Energy used in Electric Railway Departments	47,040,000	54,394,000	−13.5
Energy used in Electric and Other Departments	116,120,000	116,322,000	− 0.2
Total	163,160,000	170,716,000	− 4.4
Total Energy for Distribution	**7,382,224,000**	**6,978,419,000**	**+ 5.8**
Energy Lost in Transmission, Distribution, etc	**1,156,894,000**	**1,136,031,000**	**+ 1.8**
Kilowatt-hours Sold to Ultimate Consumers	**6,225,330,000**	**5,842,388,000**	**+ 6.6**
Sales to Ultimate Consumers (kw-hrs)			
Domestic Service	1,101,684,000	1,025,562,000	+ 7.4
Commercial—Small Light and Power (Retail)	1,128,673,000	1,059,320,000	+ 6.5
Commercial—Large Light and Power (Wholesale)	3,327,381,000	3,118,980,000	+ 6.7
Municipal Street Lighting	186,320,000	176,437,000	+ 5.6
Railroads—Street and Interurban	365,370,000	355,893,000	+ 2.7
Railroads—Electrified Steam	69,096,000	59,151,000	+16.8
Municipal and Miscellaneous	46,806,000	47,045,000	− 0.5
Total Sales to Ultimate Consumers	6,225,330,000	5,842,388,000	+ 6.6
Total Revenue from Ultimate Consumers	$156,069,100	$149,851,700	+ 4.1

DURING TWELVE MONTHS ENDING APRIL 30th

Kilowatt-hours Generated* (net)			
By Fuel	53,502,861,000	50,657,470,000	+ 5.6
By Water Power	32,852,229,000	31,462,203,000	+ 4.4
Total Kilowatt-hours Generated	86,355,090,000	82,119,673,000	+ 5.2
Purchased Energy (net)	2,968,367,000	3,240,608,000	− 8.4
Energy Used in Electric Railway and Other Departments	1,981,700,000	1,957,911,000	+ 1.2
Total Energy for Distribution	**87,341,757,000**	**83,402,370,000**	**+ 4.7**
Energy Lost in Transmission, Distribution, etc.	**14,905,921,000**	**14,598,297,000**	**+ 2.1**
Kilowatt-hours Sold to Ultimate Consumers	**72,435,836,000**	**68,804,073,000**	**+ 5.3**
Total Revenue from Ultimate Consumers	**$1,865,036,200**	**$1,794,903,400**	**+ 3.9**
Important Factors			
Percent of Energy Generated by Waterpower	38.0%	38.3%	
Average Pounds of Coal per Kilowatt-hour	1.44#	1.45#	
Domestic Service (Residential Use)			
Average Annual Consumption per Customer (kw-hr)	642	609	+ 5.4
Average Revenue per kw-hr (Cents)	5.23¢	5.42¢	− 3.5
Average Monthly Bill per Domestic Customer	$2.80	$2.75	+ 1.8

BASIC INFORMATION AS OF APRIL 30th

Generating Capacity (kw)—Steam	23,760,800	23,982,100	
—Waterpower	8,951,700	9,002,000	
—Internal Combustion	502,500	470,100	
Total Generating Capacity in Kilowatts	33,215,000	33,454,200	
Number of Customers			
Farms in Eastern Area (Included with Domestic)	(535,939)	(507,362)	
Farms in Western Area (Included with Commercial—Large)	(211,373)	(207,167)	
Domestic Service	20,587,284	20,139,047	
Commercial—Small Light and Power	3,732,376	3,687,511	
Commercial—Large Light and Power	496,963	523,241	
Other Ultimate Consumers	71,585	67,764	
Total Ultimate Consumers	24,888,208	24,417,563	

* By courtesy of the U. S. Geological Survey with deductions for certain plants not considered Electric Light and Power Enterprises.

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Modus Operandi of Public Utility Act of 1935 as Passed by the House on July 2

By P. H. Gadsden

Chairman of the Committee of Public Utility Executives

EDITOR'S NOTE: The following article is based upon the provisions of the Public Utility Act of 1935 as adopted by the House of Representatives, which is different in many respects from the Senate Bill. The measure is now in a conference committee of the Senate and the House, the committee to report to their respective bodies upon a final bill for enactment or rejection. Due to the importance of the matter, the BULLETIN is fortunate in having Mr. P. H. Gadsden, Chairman of the Committee of Public Utility Executives, present this information on the *modus operandi* of the House Bill.

DURING the five months' debate and consideration by both houses of Congress on the Wheeler-Rayburn Bill, the center of the stage has been held by the "death sentence" provision (Section 11 of Title I). There has been a tendency to overlook the far reaching provisions of this Act which regulate and bring under the strict control of the Securities and Exchange Commission or Federal Power Commission practically all public utility holding companies and most of the operating electric companies of the country.

In this discussion it is proposed to take a typical holding company with one or more subsidiary operating electric companies and briefly review how the Act passed by the House of Representatives on July 2, operates to regulate these companies in their everyday operations.

First, however, a few words on the mechanical set-up of the Act. It actually consists of two separate and fundamentally different Acts. The first of these two Acts is designated Title I, and is entitled "Public Utility Holding Company Act of 1935." It regulates

MR. GADSDEN

electric and gas holding companies, their subsidiary companies and affiliates. The second of these two Acts is designated Title II and is entitled "Federal Power Act." It consists of three parts—Part I being amendments to the Federal Water Power Act; Part II which regulates electric companies engaged in the transmission or sale of electric energy in interstate commerce or owning or operating property used for such transmission or sale; and Part III, which imposes additional regulation on licensees under the Federal Water Power Act, and electric companies regulated under Part II, and which also sets up the procedural and administrative features of the Act. Title II does not apply to holding companies which are not also operating companies.

Because these two titles are completely independent of each other, and are entirely unrelated with respect to both subject and *modus operandi*, it is necessary to consider them separately. It should be noted that the administration of Title I is conferred upon the Securities and Exchange Commission whereas the administration of Title II is conferred upon the Federal Power Commission.

Title I
Public Utility Holding Company Act of 1935

Presumably the first thing the management of the holding company would be interested in if this Act becomes law, is to see if its company can be exempted from the Act under any of the exemption provisions. (Section 2 and 3.)

Assuming that the subsidiary operating companies are engaged in the generation and sale of energy, are "controlled," within the meaning of the Act, by the holding company, and operate within the United States, the only exemption provisions which might apply to the holding company are those which authorize the Commission to make exemption where the holding company and all the subsidiaries are organized and operating substantially in a single state or where the holding company is predominantly an operating company and its operations limited to the state in which it is organized and states contiguous thereto (Sections 3 (a) (1) and (2)). If the holding company comes within one of these two catagories it

should immediately apply for exemption. As soon as this application is filed the company is exempted from the Act until the Commission, after a hearing, if the company wants one, grants or denies the application.

However, assuming the holding company decides it is not one of those entitled to exemption, then it must register with the Commission under Section 5 of the Bill. This registration may be at any time after October 1, 1935, but *must* be on or before December 1, 1935. Until the company registers none of the regulatory provisions of Title I of the Bill are effective as to it or any of its subsidiary companies. If a company has not applied for exemption, and comes within the definition of a holding company in the Act, then, unless it registers within December 1, 1935, it is subject to a fine of $200,000 for using the mails, the telephone, or any other instrumentality of interstate commerce, for almost any purpose except payment of taxes.

Registration may first be effected by the filing of a notification of registration which must be in a form to be supplied by the Commission. Subsequently, at a time to be fixed by the Commission, a permanent registration statement, including detailed information about the company, must be filed.

When the notification of registration is filed, most of the regulatory provisions of the Bill are immediately effective as to the holding company and its subsidiary companies. However, since the theory which the House has followed in the Bill is regulation by an administrative agency rather than by statutory prohibitions, there are only a few provisions of the Bill which become operative without either the Commission or one of the companies taking some affirmation action. In other words, there are three ways in which the Bill operates to regulate companies subject to its provisions: The first way is by direct statutory prohibition; the second way, by prohibiting certain things without obtaining prior Commission approval; and the third way, by prohibiting certain things unless they conform to rules, regulations or orders which the Commission is empowered to issue. These few direct statutory prohibitions are the following:

1. It will be unlawful for the holding company to have any officers or employees of any of its subsidiaries sell securities of the holding company (Section 6 (c)).

2. It will be unlawful for the holding company to borrow or receive additional credit from any of its subsidiary companies (Section 12 (a)).

3. It will be unlawful for the holding company, or any of its subsidiaries, to make any contribution to a political party or candidate (Section 12 (g)).

4. *After April 1, 1936,* it will be unlawful for the holding company to enter into or perform any service, sale or construction contract for any of its subsidiaries (Section 13 (a)).

These are the only matters which are directly prohibited by the Act itself. However, there are other matters which neither the holding company nor any of its subsidiary companies can do without first going to the Commission and obtaining the Commission's approval. These are:

1. Issue and sell securities or exercise a privilege or right to alter priorities, voting power, etc., of outstanding securities. (In the case of the subsidiary operating companies this Commission approval is not necessary if the issue and sale of the securities is subject to regulation by a State Commission or a State Securities Commission.) (Sections 6 and 7.)

2. Make short term borrowings (that is, maturing in less than nine months) of more than 5 per cent of the value of its outstanding securities (Section 6 (b)).

3. Acquire any securities, utility assets (facilities *in place* for the manufacture, transmission or distribution of gas or electricity), or interests in other businesses. (Commission approval not necessary where a State Commission approves acquisition of utility assets by one of the subsidiary operating companies or where the securities to be acquired are securities of or are guaranteed by the United States or any State, municipality or agency thereof, or are securities which the Commission authorizes acquisition of by a general rule or regulation. (Sections 9 and 10.)

The Commission cannot refuse its approval to any of the companies who propose to do any of the above matters without giving the company the opportunity for a hearing. If the Commission refuses to grant its approval the company may appeal to the Federal court and obtain a review of the Comsion's order.

On the other hand, there are very definite limitations on the power of the Commission to grant its approval. For example, it cannot approve a security issue unless it finds that (a) the security is adapted to the security structure of the company and the other companies in the same holding company system; (b) the security is properly related to the fair value of the property of the company and its subsidiaries; (c) the financing is necessary or appropriate to the economical and efficient operation of the business of the company, and (d) the fees and commissions to be paid in connection with the issuance and sale of the security are reasonable. The Commission cannot approve the acquisition of securities or assets unless it finds (a) the consideration to be paid is reasonable and is properly related to the fair value of the property to be acquired; (b) the acquisition will not unduly complicate the capital structure of the applicant company's system, or (c) if the proposed acquisition is of public utility or holding company securities or assets, it will tend toward economic and efficient development of an integrated public utility system.

The third way in which the Act operates to regulate the routine operations of the holding company and its subsidiary companies requires affirmative action on the part of the Commission before such regulation becomes operative. By far the greater part of the regulatory features of the Act comes within this catagory. These provisions prohibit the holding company and its subsidiaries from taking any action with respect to the matters which they embrace in violation of the rules, regulations, or orders issued by the Commission with respect to such matters. In other words, until the Commission acts the companies are not affected by these provisions, but if the Commission issues a rule, regulation or order (assuming it is within the power conferred upon the Commission) then that rule, regulation or order must be obeyed just as though it constituted a part of the Act itself. Those matters which are subject to regulation by this method are the following:

1. All inter-company loans (Section 12 (b)).

2. Payment of dividends or acquisition or redemption of securities. Here the rules of the Commission must be limited to those necessary to protect the financial integrity of the company, safeguard working capital or to prevent payment out of capital or unearned surplus (Section 12 (c)).

3. Sale by the holding company of securities which it owns of a public util-

ity company or sale of utility assets (Section 12 (d)).

4. Solicitation of proxies, powers of attorney, or authorizations regarding the voting of securities (Section 12 (e)).

5. Any transactions between the holding company and its subsidiary companies or between subsidiary companies of the same holding company, or between the holding company or the subsidiary company and any affiliate of any company in the same holding company system (Section 12 (f)).

6. The entering into or performance of service, sales or construction contracts by one of the subsidiary companies with any other subsidiary company of a holding company or with any person whose principal business is the performance of such services. (Section 13 (c) and (d)).

7. The form of and method of keeping accounts, books, records, correspondence, memoranda, etc., by either the holding company or any of its subsidiaries (Section 15).

Regulation of any of the above matters can be carried out only by the Securities and Exchange Commission issuing a rule or regulation or order. If by rule or regulation, it is not necessary that the companies be given notice or opportunity for hearing; the rule or regulation is effective upon publication and is not appealable to the courts unless it violates the constitution.

On the other hand, if carried out through order, the companies must be given notice and opportunity for hearing and may appeal to the Federal court to have the order reviewed.

The above discussion covers all of the significant regulatory provisions of Title I of the Act and the method by which such regulation is to be carried out, with the exception of the contraverted Section 11. The Commission cannot act under Section 11 until January 1, 1938, and thereafter. To see how this section operates, it is necessary to assume that the subsidiaries of the holding company are operating in different regions and are not physically interconnected or capable of being physically interconnected. The holding company system therefore consists of more than one integrated public utility system. The Securities and Exchange Commission decides that it should hold a hearing to determine whether it is necessary in the public interest that the holding company limit its properties to only one integrated public utility system. It therefore sets a date for a hearing. To determine whether it is necessary in the public interest to require the holding company system to be limited to one integrated system, the Commission must refer to the standards for determining the public interest which are set out in Section 1 (b) of the Act. These standards consist of two pages of carefully worded and understandable tests which holding companies must meet in order to justify their existence as consistent with the public interest. If, after reference to these standards, the Commission finds that the holding company controls its operating subsidiaries with a "disproportionately" small investment, that the functioning of the holding company system as more than one integrated system, bears no relation to economy of management or operation or integration of related properties, or in other respects results in lack of economy of operation or lack of efficiency and adequacy of service, or lack of effective public regulation or lack of economies in financing, then, under Section 11, it may issue an order requiring the holding company to limit its operations to one integrated public utility system; which means that the holding company must in some way divest itself of its interest in its subsidiary companies, except those constituting one integrated system.

If, on the other hand, the Commission finds that the functioning of the holding company as more than one integrated public utility system does not have the results stated above it must conclude that the interests of the public, consumers and investors are not adversely affected by the holding company continuing to operate as more than one integrated public utility system, and can therefore issue no order requiring the company to take any action under Section 11. So much for Title I of the Act.

Title II
Federal Power Act

Title II, as was stated at the outset, consists of three parts: Part I comprising amendments to the Federal Water Power Act; Part II providing for the regulation of electric utility companies engaged in interstate commerce; and Part III, which is entitled "Procedural and Administrative Provisions." Part I of this Title will not be considered in this discussion since it is a part of the Federal Water Power Act and can only be discussed in connection with that Act.

Title II of the Act has no application to the holding company since it only applies to licensees under the Federal Water Power Act and companies which are engaged in the transmission or sale of electric energy in interstate commerce, or own or operate facilities used for such transmission or sale.

No provision of this Title contains any direct prohibition. The regulation is achieved by requiring that the Federal Power Commission's approval be obtained before the company can do certain things and by authorizing the Commission to issue rules, regulations or orders and directing the company to conform to such rules, regulations or orders.

Immediately upon this Act becoming law, the company must obtain the approval of the Federal Power Commission before it can do any of the following:

1. Dispose of or lease assets of a value in excess of $100,000, or merge or consolidate any of its properties with properties of other persons, or purchase or acquire securities of any other public utility company (Section 203).

2. Make any change in its rate schedules for service subject to the Commission's jurisdiction; that is, the transmission or sale of electricity in interstate commerce.

Six months after the date this Act is enacted, the company must obtain the approval of the Federal Power Commission before it can do any of the following:

1. Transmit energy outside of the United States (Section 202 (d)).

2. Issue securities or assume liabilities or obligations by guaranteeing, endorsing, etc., securities of other companies (Section 204). (The approval of the Commission is not required under this section if the company is organized *and* operating in a state which regulates its security issues.)

3. Any officer or director of a public utility company must obtain approval of the Commission before he can serve in a similar capacity with any other public utility company or with any bank or firm, authorized to underwrite or participate in the marketing of public utility securities.

In addition to these regulatory powers which are operative only when the company proposes to take some affirmative action, the Commission is authorized, immediately upon enactment of the Act, to issue orders or rules and regulations with respect to the following matters:

(Continued on page 296)

Report of the Prize Awards Committee

By Frank W. Smith

President, The Consolidated Gas Company of New York, the New York Edison Company and the United Electric Light and Power Company and Chairman, Prize Awards Committee of the Edison Electric Institute

Presented before the Fourth General Session of the Third Annual Convention of the Edison Electric Institute, Atlantic City, N. J., June 5, 1935.

THE Edison Electric Institute has had the privilege of being the sponsor for seven prize awards during the past year, which have been established by the donors to encourage and promote progress in the electric light and power industry.

The Awards comprise, first, the *Charles A. Coffin Medal* awarded in recognition of a distinguished contribution of a public utility operating company, the accomplishments so recognized being all embracive of the company's activities. The second group includes those in recognition of outstanding accomplishments by companies in specified activities. They are the *Geo. A. Hughes Award* for the greatest contribution to the development of the domestic electric cookery load, and the *Thomas W. Martin Award* for accomplishments in rural electrification. The third group includes prizes to individuals for essays on subjects relating to the electric light and power industry, embracing the *H. M. Byllesby Prizes, B. C. Forbes Prize, A. L. Lindemann Prizes* and the *James H. McGraw Prizes.*

The Committee is gratified to report that 217 papers and exhibits were submitted by employees of 73 companies in 38 states and Canada in the competition for the several prizes. These papers have been on display during the Convention. It was hoped that many of the delegates would examine this exhibition, and that the display of the presentations would create further interest in the awards, particularly on the part of the Executives in encouraging their employees to enter contests for next year's prizes. These papers, like those submitted in previous years, will be on file at the Institute Headquarters, where they may be examined, and they will be loaned to member company representatives upon request. The many valuable contributions brought forth through these contests will be reproduced in the Institute BULLETIN.

The presentations have been reviewed, evaluated and the winners selected by a separate group of three judges for each award, each of the judges being an outstanding representative in the respective fields of the awards. The Institute and your Committee are greatly indebted to these gentlemen who so willingly performed this very laborious task.

MR. SMITH

It is with pleasure that the Committee announces the results of the contests. I am going to ask each winner, as his name is called, to step to the platform and receive the award direct from the hands of the donor, or his representative, who have very kindly consented to be on the platform for this purpose.

The Charles A. Coffin Award

The Charles A. Coffin Medal, under the terms of the Charles A. Coffin Foundation, established by the General Electric Company, to pay tribute to that great leader in our industry, the late Charles A. Coffin, is awarded to that company which, during the previous year, has made a distinguished contribution to the development of electric light and power for the convenience of the public and the benefit of the industry. The award to be made today is the eleventh award of the medal which was created in 1922. Winning this medal is a signal honor and properly so regarded.

In the annual competitions for the award since its inception a total of 115 presentations of accomplishments have been submitted. These records of achievements have been preserved and are on file at the Institute offices. They are of inestimable historical value, setting forth as they do the remarkable progress and growth of the electric light and power industry. They will become more valuable as the years go on.

For accomplishments during the year 1934 presentations from five companies were submitted. These presentations have been on display during the Convention and will be loaned to any member of the Institute for more detailed study. It is hoped that the membership will take advantage of this opportunity, as the material contained in all of the presentations will be found most interesting, constructive and valuable.

I should like to briefly review the most outstanding accomplishments of the winning company before making the award. First, I would like to point out that the Committee, in evaluating what the companies have done, considers the question from four different angles: general administration, commercial accomplishments, engineering accomplishments and the over-all results as revealed by statistical information.

The 1934 record of the winning company is outstanding. It accomplished one of the most remarkable sales increases in residential, commercial and industrial power sales in the history of this great industry.

Confronted with a most difficult and serious competitive situation, this company proceeded upon a definite plan of increased business development which involved an immediate rate reduction with a further substantial objective reduction in view, coupled with an intensive sales campaign. The success of these efforts in increased average usage, in reduced average rates, in increased total sales and in appliance sales has been truly noteworthy.

The company's advertising was well designed and effective. The performance of its engineering and operating

departments was splendid. But above everything else, the most remarkable and praiseworthy feature of this company's operations during the past year has been the degree to which the entire company, from its President down to its janitors and office boys, as revealed in the presentations made, have been galvanized into driving action, have rolled up their sleeves in a common purpose to greatly increase the use of electricity in the company's territory, to maintain the highest possible standard of service and to promote the good will of its customers toward the company.

It gives me pleasure to announce the unanimous decision of the committee of judges consisting of Dr. Karl T. Compton, President of the Massachusetts Institute of Technology; Thomas N. McCarter, President of the Edison Electric Institute, and the speaker, which unanimously awards, for outstanding accomplishments during the year 1934, the Charles A. Coffin Medal, the certificate of award and the cash prize of $1,000 for use of the employees' benefit association, to the *Tennessee Electric Power Company,* Chattanooga, Tennessee, a subsidiary company of the Commonwealth and Southern Corporation.

Mr. Jo. C. Guild, Jr., President of this organization, is here and I would ask that he please come forward to receive the award from Mr. Gerard Swope, President of the General Electric Company.

The George A. Hughes Award

A trophy donated by Mr. George A. Hughes, President, Edison General Electric Appliance Company, Inc., to the Public Utility Operating Company showing the greatest contribution to the development of the Domestic Electric Cookery Load, through promotion or selling, or both, during the twelve-month period ending February 28, 1935, and cash prizes totaling $1,000 to the individuals responsible for the achievement.

Under the terms and conditions of this award, the cash award of $1,000 is to be divided as follows:

Five hundred dollars is awarded to the Commercial or Merchandising Executive responsible for the achievement, and $500 to be divided among the retail sales directors and retail salesmen by the Commercial or Merchandising Executive, in proportion to the extent they have contributed to the company's activity in the promotion of the electric range.

The award further provides that where a company is not engaged in the actual merchandising of electric ranges, the second $500 may be distributed at the discretion of the commercial executive either to members of his department working with outside agencies or to the agencies themselves.

The judges of this award—Mr. Marvin Knight, Mr. Ell C. Bennett and Mr. W. E. Underwood—were guided in their selection of the winner by the following terms of the award:

1. Highest percentage of Electric Ranges (5 Kw or over) connected during the contest period in proportion to the total number of wired homes not using electric ranges at the beginning of the contest period. This applied to all sales in the community, and the replacement of obsolete, inefficient types of ranges was considered.
2. Creative sales and advertising plans.
3. Effectiveness of cooperation with agencies outside the actual merchandise department of the Central Station to promote the sales of electric ranges.

It gives me pleasure to announce that the *Florida Power & Light Company* is the winner of the George A. Hughes Award.

In the terms and conditions of the contest it was recognized that sales volume was the major objective, but also the importance of a definite and comprehensive plan was emphasized and while three companies had a higher percentage of ranges connected during the period of the contest than the declared winner, the percentage marking for the over-all sales plan was enough higher to raise the total of the Florida Company above the other competing companies. In other words, the judges had the thought in mind of sales methods and skill of execution as well as the sales record.

The conditions under which the Florida Power and Light Company operated, the comprehensive promotional program to surmount these conditions, the straightforward selling policies, cooperative relationships with dealers and the results obtained in a territory extremely affected economically were considered by the judges as deserving of the award.

Mr. George C. Estill, President of the Florida Power and Light Company, is here and I would ask that he please come forward to receive the award from Mr. George A. Hughes.

The cash prize of $1,000 is awarded, $500 to Mr. R. H. Fite, Jr., Sales Manager of this Company, as the person responsible for the achievement, and $500 to be distributed by Mr. Fite within the terms of the award to those who assisted in the accomplishments.

A number of excellent presentations were submitted this year, indicating a marked progress in the development of the electric cookery load and the Judges recommended Honorable Mention to be given to the Tennessee Electric Power Company and the Hartford Electric Light Company because of the splendid accomplishments shown by these two companies.

An announcement of the generous action of Mr. George A. Hughes in continuing his award through another year was made in the February issue of the BULLETIN and an invitation to enter the competition mailed in April, in order that early plans could be made for sales achievement in electric cookery during 1935.

I suggest that appreciation of Mr. Hughes' interest in continuing the award can best be expressed through wide participation in the contest for the current year.

The Thomas W. Martin Award

A bronze plaque donated by Mr. Thomas W. Martin, President, Alabama Power Company, to the company member of the Edison Electric Institute showing the greatest contribution to the advancement of Rural Electrification during the year 1934.

The judges for this award were Mr. J. S. Tritle, Mr. Philip S. Rose and Dr. E. A. White.

The Thomas W. Martin plaque has been awarded to the *Puget Sound Power & Light Company,* Seattle, Washington, as the company showing the greatest contribution to the advancement of rural electrification during the year 1934.

The company showed outstanding accomplishments in agricultural advancement within the company's territory due to uses of electricity, development of rural load, cooperation with other agencies, extension of rural lines, and a substantial increase in rural sales, all of which was the result of a comprehensive plan energetically pursued.

Mr. E. C. Easter is here to present this award and Mr. Henry J. Gille, Manager of the Agricultural and Industrial Development Department of the Puget Sound Power & Light Company, is here to receive it on behalf of his organization.

The H. M. Byllesby Award

Three cash prizes—one of $100, one of $50 and one of $25—donated by Byllesby Engineering and Management Corporation, in memory of Colonel H. M. Byllesby, for the three most

meritorious papers on any Accounting subject relating to the Electric Light and Power Industry.

Mr. R. J. Graf of the Byllesby Engineering and Management Corporation is here to award these prizes on behalf of his organization.

The judges for this award were Dean John T. Madden, Mr. B. F. Braheney and Mr. William Paxton Little.

First prize has been awarded to MR. R. E. KERNS of the Oklahoma Gas & Electric Company, Oklahoma, for his paper, "The Challenge to the Electrical Utility Accountant of Today."

The second prize goes to MR. JOHN H. O'GRADY of the Chicago District Electric Generating Corporation, Chicago, for his paper, "The Application of Fund Accounting to the Wholesale Electric Light Industry."

Third prize has been won by MR. SAMUEL J. HELFMAN of the Philadelphia Company, Pittsburgh, Pennsylvania, for his paper, "Guide to the Industry in the Statistical Analysis of Reported Residential Sales."

The B. C. Forbes Prize

A cash award of $250, donated by Mr. B. C. Forbes, Editor, *Forbes Magazine*, for the most meritorious paper dealing with the subject of Public Relations in the Electric Light and Power Industry.

Mr. Forbes is here.

There were 121 papers submitted in competition for this prize. The outstanding quality and merit of a number of the papers submitted made the awarding of this prize a difficult task. The judges, Mr. P. L. Thomson, Mr. Bruce Barton and Judge C. W. Appleton, after careful consideration awarded the prize to

MR. ROBERT C. CLEMINSON of the Nebraska Power Company, Omaha, Nebraska, for his paper: "Requisite Policies for Good Public Relations in the Future."

Unfortunately, Mr. Cleminson could not be present to receive his well deserved award. I would therefore like to ask Mr. James E. Davidson, President of the Nebraska Power Company, to accept the award on behalf of Mr. Cleminson and convey it to him with our congratulations.

The judges deemed it fitting to award Honorable Mention to

Eugene R. Schief, Brooklyn Edison Company, for his paper entitled "The Public Reaction to our Industry and the Resulting Problems."

Daniel Ravenel, Jr., South Carolina Power Company, for his paper entitled "Private Power Must Be Preserved," and to

William E. Frazer, San Diego Consolidated Gas & Electric Co., San Diego, California, for his paper entitled "The Public Must Know."

The judges, in notifying me of their decision, stated that "All four of these papers, we believe, are worthy of wide reading throughout the industry, and we hope the Institute will find some way of bringing about such publicity."

The papers will, of course, be given the widest possible publicity.

The A. L. Lindemann Prizes

Three cash awards—one of $150, one of $100 and one of $50, donated by Mr. A. L. Lindemann, Vice-President and General Manager, A. J. Lindemann and Hoverson Company, for the three most meritorious papers dealing with the advantages of electric cookery for domestic purposes.

Mr. J. H. McKenna is here to present the prizes in behalf of Mr. Lindemann.

The judges for this award were Mr. Earl Whitehorne, Miss Katherine Fisher and Mr. W. F. Henze.

This subject was especially attractive to the ladies. They submitted 22 of the 37 papers entered for the competition, and, as you will note, succeeded in winning all three prizes.

The winning papers, in accordance with the terms of the award, were entitled "Advantages of Electric Cookery for Domestic Purposes."

First prize was won by MRS. DERA ARRINGTON of the Oklahoma Gas & Electric Company, Oklahoma City, Oklahoma.

Second prize was awarded to MISS E. MAE JONES and third prize to MISS ANNE L. ROBERTSON, both employed in the Virginia Electric & Power Company of Richmond, Virginia.

The James H. McGraw Prizes

Three cash awards—one of $250, one of $150, and one of $100, donated by Mr. James H. McGraw, Chairman of the Board, the McGraw-Hill Publishing Company, for the three most meritorious papers on any Engineering or Technical subject relating to the Electric Light and Power Industry.

Mr. Howard Ehrlich, Vice-President of the McGraw-Hill Publishing Company will present the prizes on behalf of Mr. McGraw.

The judges of this award were Mr. R. H. Tapscott, Mr. Louis Elliott and Mr. L. W. W. Morrow.

First prize goes to MR. J. E. ALLEN and MR. G. J. GROSS of the Pennsylvania Water and Power Company, Baltimore, Maryland, joint authors of the paper, "A Method of Locating Faults on Overhead Transmission Lines by Means of High Frequency."

The second prize was awarded to MR. GEORGE G. GUTHRIE of the Detroit Edison Company for his paper: "Apportionment of Load Among Dissimilar Units."

Third prize was won by MR. M. L. WARING of the New York Edison Company for his paper: "Stability of Interconnected Electric Power Systems."

Reestablishment of Curtis Award

I am pleased to announce that the Augustus D. Curtis Award will again be available for the competition of Member Companies after a lapse of two years.

This award consists of a certificate contributed by Mr. Kenneth Curtis, President, Curtis Lighting, Inc., in memory of Augustus D. Curtis, founder and first President of that Company, to the Electric Light and Power Company member of the Edison Electric Institute that shows the greatest contribution to Electric Lighting of Commercial and Public Buildings, and a cash prize of $250 to the person or persons responsible for the achievement.

The Award will be for accomplishments during the year 1935 and will be presented at the 1936 Convention of the Institute.

On behalf of the Institute and the Prize Awards Committee, I wish to express sincere appreciation to Mr. Curtis for re-establishing the Curtis Award.

Edison Electric Institute Medal

I think it fitting to report here as to the awards of the Edison Electric Institute Medal. The medal, established at the time of the organization of the Institute, was created as a recognition for the successful resuscitation of individuals suffering from electric shock, and to maintain and encourage interest in the training of employees in the use of the Schafer Prone Pressure Method of Resuscitation for the saving of life.

Twelve medals have been awarded to employees of member companies since the first five awards were made at the Convention in June last year.

In accordance with the terms of the award, these medals were presented by the managing or other responsible executive of the recipient's company at company group meetings, safety rallies and other large gatherings of employees and

(*Continued on page* 283)

Report of Sales Committee

By H. P. J. Steinmetz

General Sales Manager, Public Service Electric and Gas Company, Newark, N. J., and Chairman of Sales Committee, Edison Electric Institute

Presented before the First General Session of the Third Annual Convention of the Edison Electric Institute, Atlantic City, N. J., June 3, 1935

IN spite of the fact that the electric light and power industry in the last year has been confronted by the gravest problems of its long and useful existence, it has made material progress in the expansion of its service and, through the success of its sales efforts, has contributed measurably to the economic progress of the nation. The interest on all sides in the work of your sales committtee is reflected in the success of its programs.

This report will briefly touch on the more important phases of the work of the subcommittees.

Air Conditioning

The work of the Air-Conditioning Subcommittee is, like the subject itself, practically in its infancy and the time is probably not remote when its work will grow into the proportions of a nationally organized program, with regional, state, and local tie-ins similar to the organization of the former National Electric Refrigeration Bureau and the present Better Light-Better Sight activity. This year the Air-Conditioning Subcommittee is doing the industry a signal service by collecting factual data on the operating costs of various installations. This information should be useful to everyone selling air-conditioning. That the amount paid for electricity for air-conditioning is definitely not a deterring factor and is, in fact, relatively insignificant, is among the facts brought out by these studies.

Industrial Power and Heating Subcommittee

While the work of some of the subcommittees concerned with the domestic field has, because of its nature, been probably more spectacular, that of the Industrial Power and Heating Subcommittee is concerned with the retention and extension of an important part of the business of most power companies. The studies of this committee are technical and special and relate to such subjects as power interconnection contracts with industrial plants, industrial power transmission, use of electricity for oil production, refining, and pipe line pumping, industrial heating, and steam and Diesel competition. Recently the Institute published a report on "Steam and Electrical Requirements of Office Buildings," prepared by the Industrial Power and Heating Subcommittee. This will be followed by a report on "Steam and Electrical Requirements of Hotels." Both reports contain information which should prove of real assistance in the solicitation of this class of business.

MR. STEINMETZ

This committee also concerns itself with the subject of commercial cooking, and has prepared a report on the progress made in this field by a number of companies, which was published in several trade magazines.

In addition this committee has made studies and has disseminated information relative to advertising sales aids on power.

Rural Sales Subcommittee

At last year's convention Mr. P. H. Powers, the chairman of the Rural Sales Subcommittee, outlined the program of the Electric Water Systems Council, composed of pump manufacturers and central station men, which was organized by his committee. The program was started in July, 1934, and gave the industry an effective plan for developing rural water systems sales, and thereby contributing further to the comforts and conveniences made possible by the industry's extension of electricity to rural areas.

In December of last year the production of domestic water pumps showed a 42 per cent increase over the corresponding month in the previous year. Credit for much of this increase has been conceded by the manufacturers to the effectiveness of this program. Total sales in 1934 amounted to 64,000 units and, according to the manufacturers, at the rate business is now going, production will approximate 100,000 units in 1935.

To carry out this program a plan book, advertising broadsides, and animated window displays have been prepared and are available at headquarters of the Institute.

A report on the work of the Water Systems Council would be incomplete if it omitted reference to the splendid spirit of cooperation that has been created between pump manufacturers and the light and power industry.

I would bring to your attention the helpful publication issued bi-monthly by the Rural Sales Subcommittee. It is a valuable exchange of utility company experiences and informational data on rural load-building. *Rural Electrification Exchange* is distributed from Institute headquarters free to all rural service representatives.

Wiring Subcommittee

While necessarily lacking in spectacular character, the importance of the work of the Wiring Subcommittee cannot be overestimated. Its efforts to overcome the restriction which needlessly expensive wiring places between the supply of electrical energy and its utilization are noteworthy. Its attention to the extension of the same restrictive effect on utilization devices under a procedure in which our industry has no part is of great importance to the expansion of our service. The obstacles in its path of progress are

so well known that they need not be enumerated here.

A Special Committee headed by Mr. E. A. Brand, coordinating with members representing National Electrical Manufacturers' Association, Illuminating Engineering Society, National Electrical Wholesalers' Association, International Association of Electrical Inspectors and others, have started the preparation of complete adequacy specifications for wiring in commercial and in industrial structures. These will be patterned after the specifications produced some time ago for wiring in residences and apartment buildings. Once this job is completed it will be a valuable aid to all branches of the industry and will have wide circulation.

The Wiring Subcommittee, no less than the subcommittees engaged in promotional sales work, deserves the support of all. The future of our expansion is, in a large measure, dependent on the success of our efforts to control these restrictions.

Electrical Housewares Program

In the electric utility industry, we cannot rest our case with a market approach of any one household appliance service to build our load. Our duty is to make continued attacks on all fronts. This application has influenced national planning and coordination to motivate one promotional program after another to stimulate sales action. In the past few years manufacturers and other branches of the electrical industry, in addition to other industry groups, have been mobilized in cooperative action nationally and locally.

The necessity for promotional sales efforts on the smaller appliances along national lines was recognized and a Table Cookery Program was organized last year, which has been increased in size and usefulness in the Electrical Housewares Program. About fifteen years ago small appliances held the stage, but were crowded out by the urge for rapid load-building with appliances with large energy use.

Sales Increased

The Electrical Housewares Program, which is sponsored by a group of manufacturers and central station men representing your Sales Committee, rescued the small appliances from the "pots and pans" class and gave them the dignity and importance they deserve on any utility's load-building program. As a result, substantial increases are reported in sales of small appliances by both utilities and their dealer allies. I commend the monthly publication of the committtee—*Electrical Housewares*—to your reading.

The possibilities of the extension of the work of the committee handling this program are great, and merit your wholehearted support. The use of small appliances often converts a customer from the non-profitable to the profitable class.

Lighting Sales Subcommittee

The work of the Lighting Sales Subcommittee was overshadowed when the Better Light-Better Sight activity was taken from the list of activities of that committee and organized under a separate bureau. It has cooperated with the Better Light-Better Sight Bureau and has started important work to increase the load of commercial, industrial, street and highway lighting. Under the direction of the Lighting Sales Subcommittee there was prepared and distributed "The 1935 Plan for Better Commercial and Industrial Lighting," which is a material contribution to the field of lighting sales.

Better Light-Better Sight Bureau

It is hard to realize that it was only a year ago that Mr. Merrill Skinner outlined from this platform the plans of the Better Light-Better Sight Committee to expand the movement and include other industry groups. It seems incredible that such outstanding realities could develop from those plans in so short a space of time.

The coordination of all related groups has been accomplished by merging our committee into a National Better Light-Better Sight Bureau. The other industries associated with us in the bureau have made superb contributions to the movement. The Better Vision Institute, particularly due to its intimate association with all matters pertaining to sight, has been most generous in its support. They have flooded their membership with helpful information on light; they have woven the value of light to sight into the literature, advertising, slide films, and radio continuities which they have produced. Recently they have announced a project, the influence of which, on the way the public accepts light, will be astounding. I refer to the Light Prescribing Technique they have developed and perfected for their membership. Through the courtesy of several of their member companies, an exhibit and demonstration of this procedure has been arranged at the rear of the meeting room. I earnestly hope all of you will watch a demonstration of this technique. Attendants will be present before and after each of our convention sessions. You can then judge for yourself the import of this development and gauge your cooperation accordingly.

The Paint Industry has likewise cooperated splendidly, but we must remember that their stake in this movement is not as great as ours, and we must not be surprised if locally we fail to kindle in them the same enthusiasm which we feel.

A year ago Mr. Skinner referred to the *coming* I.E.S. Better Sight lamps and urged us to promote them actively. The promotion which ensued combined with the inherent merits of the product resulted in the sale of approximately one-half million of these units. Today this type of lamp practically dominates the portable lamp field—all this in one short year.

The Better Light-Better Sight Bureau *News* will continue as the means of informing all interested parties of plans as they develop. It is about the only way this can be done with a program that is expanding so rapidly.

One significant thing about the Better Light-Better Sight movement has been its effect in stimulating the formation of local groups interested in eyesight conservation. Almost a hundred groups have been started during the past year, many of them doing an outstanding job in a field where there are no precedents to follow. This bears witness to the sound basis of intense interest in eyesight on which the whole Better Light-Better Sight movement rests.

I feel it hardly necessary for me to point out the desirability for starting your plans now for even greater activity on lighting this fall. The increasing public-consciousness fully justifies the expectation that future results will be even more satisfactory than those accomplished to date.

Only a Beginning

In conclusion, reference should be made to the interest evinced in the work of the Sales Committee as evidenced by the attendance of about 300 at its annual Sales Conference which was held in Chicago, late in April. This, I believe, is significant and gives expression to the hope that the entire industry, including the manufacturers, wholesalers, contractors, and dealers, will unite under the programs of the committee in expanding what is today one of the greatest sales efforts in the country and which has as its goal the complete electrification of the nation. What has so far been accomplished is, after all, only a beginning; what can be accomplished challenges the imagination.

Increasing Our Sales

By Jo C. Guild, Jr.

President, The Tennessee Electric Power Company, Chattanooga, Tenn.

An address before the Third General Session of the Third Annual Convention of the Edison Electric Institute, Atlantic City, N. J., June 4th, 1935

TO present a clear picture of the methods employed by The Tennessee Electric Power Company in increasing sales, it seems to me essential first to give this audience a few facts about the Company and its territory.

The Tennessee Electric Power Company serves approximately two-thirds of the state of Tennessee, and through a subsidiary company a small area in north Georgia. At the present time we are serving 96,000 residence customers. The Company owns and operates electric and transportation systems in Nashville and Chattanooga, cities of 150,000 and 120,000 population, respectively. Also, it supplies electric service to 400 other towns and rural communities, none of which exceed 10,000 in population. We employ at present twenty-seven hundred people.

Our residence customers are divided, roughly, in the following proportion: out of 11 customers, four are in Nashville, three in Chattanooga, and four in the rest of the territory. According to the latest available figures, the state of Tennessee in 1934 ranked 42nd in spendable money per capita.

The revenue from our residential sales last year was about $2,910,000, or 11 per cent under our peak year 1931. For the first four months of this year our revenue is running at the rate of $3,100,000 per annum. In contrast to this, our residential electric sales in kilowatt-hours for last year increased 33 1/3 per cent over 1931.

A discussion of The Tennessee Electric Power Company's efforts to increase sales of electricity is in reality a review of events extending over a period of 18 months. In June, 1933, the Company had seven residential rates in force. There was a lighting rate in Nashville, another in Chattanooga, and a third for the small towns and rural areas. We had, also different refrigeration and cooking rates for each of these three groups, and in addition to all of them, an off-peak rate for water heating. We had no special rural rates.

The thought that I would like to leave with you is this: In your Company your regular selling organization comprises probably 10 per cent of your entire personnel. Make the other 90 per cent sales minded and load building conscious and you will be surprised at the results you will obtain.

At that time our State Utilities Commission ordered into effect a reduced state-wide uniform residential rate, superseding six of the seven schedules mentioned. This change in rate schedule, if our consumption had not been increased, would have meant a cut in our residential revenue of about $300,000, or 10 per cent. On account of our already decreased business, it was a loss that we could ill afford to take.

The Company had been actively engaged in merchandising during the five years prior to the depression, but as business conditions had grown worse in 1931 and 1932 our merchandise sales had become less and less, and on account of our inability to maintain sales volume we had cut down, in fact, on our efforts.

The situation that confronted us with this rate cut was indeed most serious. After a good deal of thought and study and argument pro and con, we decided that the only thing to do was to embark on a strenuous sales campaign. At that time our sales organization comprised about 150 people. We decided that, if we could get a majority of other employees of the Company actually to sell or to become interested in sales work (with the proper amount of promotional activities thrown in) we could improve our situation considerably.

Accordingly, a very elaborate and rather expensive merchandise sales campaign was set up for the fall of 1933. This campaign was based on the idea of selling electrical merchandise of every kind and description. Its success or failure was to be judged, not by the dollar volume of merchandise sold, nor by the profit made on the merchandise, but by the estimated number of kilowatt-hours the Company would sell through the customers' use of the appliances sold. For instance, the sale of a $4 flatiron brought an employee two and a half times as much credit as did the sale of a $125 washing machine.

The first job that had to be done before the campaign started was to enlist the help of every employee from the president of the Company down to the negro track men. To secure their interest and cooperation, instead of having employees come in to the various headquarters offices to attend meetings, we arranged for the top executives of the Company to circuit-ride the entire property and talk to the employees in relatively small groups at places most convenient to their work. This method of getting our ideas over to every employee was rather strenuous on those of us who went on this barnstorming expedition. It was more convenient, however, for the employees, and was less expensive for the Company. Furthermore, the appearance of these executives, drawn from every branch of the business, making talks on merchandise, brought home to the employees the seriousness and importance of the undertaking.

In the initial talks by these executives, all employees, irrespective of position,

were taken into the absolute confidence of the management. They were told that our revenue had been cut—that not only the residential revenue but also the power and commercial, as well as the transportation revenues, were down—and that the only way the Company could avoid further retrenchment was to build these revenues back. They were told that it was up to every man and woman in the employ of the Company to go out and talk current consuming devices. They were told to sell them to their friends and neighbors. They were told that we wanted twenty-five hundred salesmen working continuously.

For the campaign we devised a system of commissions, bonuses, and most attractive prizes for real sales. On account of the fact that all the employees had had their salaries or wages cut, these commissions and bonuses were doubly attractive. Compensation paid the regular merchandise employees was arranged so that they would not suffer, but rather gain, from the activities of the other employees. A system of co-operation, instead of competition, was provided between employees selling and regular full time merchandise salesmen.

For the purposes of the campaign the employees were grouped according to the six districts into which the Company's territory is divided for ordinary operation. The six district managers had worked jointly with other executives of the Company in setting up the campaign, so that this initial activity which took the form of a mythical "World Cruise" was the composite idea of practically everyone who held an important position in the organization.

To add humor and color and carry out the nautical idea, I was the captain of the ship, the general manager was the first officer, the manager of production and transmission was chief engineer, and the treasurer of the Company was made the purser. Various other positions on the mythical steamship were filled by department heads, and the run of employees comprised the crew. All this comedy created a great deal of interest; during the campaign and for a long time afterward, the employees addressed me as Captain Guild.

In getting up this plan the ideas and thoughts of the men in the Engineering, Production and Transmission, and Transportation Departments — departments which normally pay very little attention to sales activities—were really given the most weight; so that when the campaign started they would be absolutely tied in to it and would have a definite responsibility for its success. In this connection, it might be interesting to note that some of the best ideas and the best work on this sales effort came from employees who previously had had no interest in whether we sold one electric range or five hundred. This, I believe, has been the main factor in building our residential consumption and selling such a large volume of merchandise.

For instance, the idea of selling a good standard make electric iron for $1.95, which formerly had sold for about $4.00, was advanced by one of our operating engineers, who had never sold anything in his life and whose job is to assist in determining allocation of plant loading and purchased power. To indicate how successfully this iron, cheap in price, has been sold, the largest iron sales the Company ever had previous to the advent of this low priced iron was about 4,000 in a year. Last year we sold approximately 20,000.

To show you the deep interest that employees in every branch of the business have taken in sales work, I will relate another instance. As I walked out of our main office building in Chattanooga the other day I observed the head of our railway maintenance department walking across the street and depositing several packages on a street car that had stopped at the corner. As this employee came back to the building I asked him what he was doing. He said that one of the colored track gangs doing some work in a negro section of town had been selling irons and percolators during the lunch hour, and had sold seven irons and three percolators—all for cash—and the foreman had sent word to have the appliances sent out on a street car, so these salesmen could make their deliveries.

The success of this campaign and the enthusiasm with which the employees entered into the spirit of it and sold current consuming devices—approximately two-thirds of the employees actively participating—showed us that by carrying on these same methods we could sell merchandise and build up our consumption and justify the large expense of this effort. We, therefore, determined to continue to carry out this idea of intensive merchandising with employee cooperation, and in consequence we increased the personnel of our Sales Department.

However, our sales activities were not limited to the sale of merchandise. In the residence field we employed quite a number of young women to visit the customer's homes and improve the lighting. We also increased the number of lighting salesmen to work on commercial and factory customers. We added to our power sales department. We enlarged our selling force in the commercial cooking, heating and refrigeration field, and also took on men with practical knowledge of air conditioning. To be specific, the sales force was practically doubled in less than twelve months' time.

During the same period we doubled our advertising expenditures, realizing that adequate and intelligently planned publicity was essential. In this advertising program we used practically all of the usual media. In an effort to win a better appreciation for the value of our service, we humanized and dramatized our advertising and publicity by the use of the well known character of Reddy Kilowatt, the electrical servant. Reddy appeared in all of our newspaper advertising, on billboards, in window displays, and in direct mail pamphlets. We inaugurated a series of playlets over the radio in which Reddy demonstrated the value of good lighting and other services as well as solving electrically most of the problems of the average housewife.

In February, 1934, following an agreement with the TVA, The Tennessee Electric Power Company filed two new rates which meant further loss of revenue. One rate known as the "Immediate Rate" provided for an immediate reduction in customers' bills. The other known as the "Promotional Rate" provided for an even greater reduction in cost per kilowatt-hour to customers who increased their monthly use of electricity over the corresponding period of the previous year. The Promotional Rate was a great stimulus to the sale of electrical merchandise, for it permitted a greater use of electricity by some classes of customer for little, if any, increase in their bills. This condition led some of the companies adopting such a rate to advertise "free electricity." The Tennessee Electric Power Company in its advertising never used the word "free." We used the phrase "extra electricity at no additional cost."

After introducing these new rates the Company commenced an intensive campaign to sell the new rates to the public. We first called group meetings of all employees over the property and thoroughly explained to them the working and the advantages of the new rates. Also, newspaper advertising, bill stuffers, direct mail, and the radio were used. In other words, the rates were "mer-

chandised," using practically every means that usually are employed in selling.

This rate cut made it necessary to push our sales program more than ever before. The experience that our employees had gained in that first employees' campaign stood them in good stead, for it had proved to them that they actually could go out and talk to their friends, neighbors, and acquaintances about the operations of the Company. They found that they not only could talk rates and sell small devices, but also could interest their friends and sell them the major appliances.

In May, 1934, the E.H.F.A., subsidiary of the TVA, announced their refrigerators, ranges, and water heaters. These TVA models, with the exception of the refrigerator, were standard models that we already had been selling. The only difference was that the prices and carrying charges had been lowered. The Tennessee Electric Power Company entered into this sales activity wholeheartedly. Although we used the finance plan outlined by the E.H.F.A., we carried all of our own paper and never have rediscounted any of it with the Government. However, we have acted as a collection agency for the E.H.F.A. by collecting the monthly installments on appliances sold by the various dealers in our territory who have contracts with the E.H.F.A.

As a result of the unprecedented amount of free publicity accorded the activities of the E.H.F.A. by the newspapers of our territory, the public—especially in Chattanooga—became more fully sold on the uses of electricity. Nevertheless, we found it took a large amount of paid advertising of every nature, plus direct selling efforts, to market this equipment. To illustrate this point, the sales of merchandise in adjacent territory where the greatest activities of the TVA have been going on, have been comparatively small, I understand. The reason for this, I believe, is the fact that the utility in that territory, with rates the same as ours, has for perfectly valid reasons ceased its merchandising activities.

We have held one campaign in the fall of 1933, four campaigns in 1934, and at present are completing our second campaign in 1935. During the remainder of this year we intend to have at least two more large campaigns and one small one around Christmas time.

In all our campaigns the participation by employees has been fairly consistent, averaging from two-thirds to three-fourths of the total number of employees on the payroll. We feel that this proportion of employees selling is fairly good when we take into consideration the large number of employees who, of necessity in a company like ours, are located in the "sticks," but we are not fully satisfied and hope to have a larger proportion of the employees selling. One of our smaller districts, in a campaign run a little over a year ago, had 100 per cent employee participation, and this goal, we believe, can be reached for the entire Company.

In addition to the various means we used to stimulate selling, we enlarged and carefully scrutinized all the methods employed by our servicing department, so that the satisfactory operation of the appliances already on the lines would be assured. We encouraged the general run of employees to receive and make a note of complaints of every kind from anyone with whom they came in contact at any time. When this practice was started we had quite a large number of complaints, most of them meritorious, but the number has been decreasing constantly, although the employees have not ceased to report any complaints received.

Although our dealer relations were in fairly good shape, we have established closer contact with all of them and have assigned men from our own organization to work with dealer salesmen exclusively. The dealers in our territory always had sold quite a number of electric refrigerators, but the sales of ranges and water heaters had been practically nil. At present they are increasing gradually and we hope to build up these sales, over a period of time. When we started this intensive employee selling there was apprehension on the part of some of the members of our organization as to the dealer relationship. The dealers have found that our twenty-seven hundred employees talking electrical merchandise help their sales as well as ours. We pay a commission to any of our employees whose prospects are sold by dealers; so instead of injuring our dealer relationship this employee selling has bettered it.

During the eighteen months since the start of this merchandise activity we have sold approximately 12,000 refrigerators, 6,000 ranges, and 3,000 water heaters. This means that during this period we have increased the refrigerators and ranges connected to our lines by approximately 50 per cent, and have quadrupled the number of water heaters; so, at present, we have a refrigerator for about every two and a half customers, a range for about every five customers, and a water heater for every twenty customers. The sales of merchandise in dollar volume have amounted to approximately $25.00 per residence customer in the last twelve months. The annual use per residence customer on the first of September, 1933, was 594 kwhr, and the use on May 1, 1934, was 645 kwhr. The use on May 1, 1935, was 840 kwhr. This is an increase for the last twelve months of approximately 200 kwhr or a little over 30 per cent. All of this, as I have said before, in a state which ranks forty-second in spendable income.

The yearly revenue per residence customer on the first of last May was $33.56, and although the use in kilowatt-hours has increased 30 per cent the revenue on a yearly basis is still about 3 per cent less than a year ago. During the last three or four months this revenue has begun to increase and we feel that before very long, if there are no further rate reductions other than those already filed with the Commission, our residence revenue will show a gain over the previous year.

In looking over this whole proposition of increasing our sales, you will see that we have used practically every medium of advertising and ordinarily used sales promotional activities—sparing no expense nor effort in building up an efficient well rounded advertising department, sales organization, and service department; but in addition we have consistently enlisted and used practically all of the employees of the Company in this merchandising and load building program.

The thought that I would like to leave with you is this: In your Company your regular selling organization comprises probably 10 per cent of your entire personnel. Make the other 90 per cent sales minded and load building conscious and you will be surprised at the results you will obtain.

EDITOR'S NOTE: The space in the box on page 249 was originally reserved for a photograph of Mr. Guild, but since his picture appears twice in the following two pages, we decided that three times in one issue was a little too much —even for a Charles A. Coffin award winner.

AT THE CONVENTION WITH ASH COLLINS' CANDID CAMERA

Upper row—Harvey C. Couch, Arkansas Power and Light Company and C. E. Groesbeck, Electric Bond and Share Company; and J. E. Davidson, Nebraska Power Company.

Center row—J. G. Holtzclaw, Virginia Electric and Power Company; Jo. C. Guild, Jr., Tennessee Electric Power Company; Leslie Weiss, Utility Management Corporation, and Ashton (Reddy-Kilowatt) B. Collins, perpetrator of these portraits.

Lower row—Robert C. Fite, Florida Power and Light Company (holding Hughes Award), George C. Estill, Florida Power and Light Company, Mrs. Estill and Miss Estill; Arthur C. Watt, Commonwealth and Southern Corporation, and John C. Costello, Tennessee Electric Power Company.

Upper row—Gerard Swope, General Electric Company, Jo C. Guild, Jr., Tennessee Electric Power Company (holding Charles A. Coffin Medal and Certificate) and Frank W. Smith, The New York Edison Company; President McCarter, presiding, and Harvey C. Couch, Arkansas Power and Light Company, speaking.

Center row—Miss Mae B. Woods, Edison Electric Institute and Judge C. W. Appleton, General Electric Company; Miss Evelyn Darling, Edison Electric Institute; George Conover, Electrical Association of Philadelphia, and L. E. Moffatt, Electrical Merchandising.

Lower row—Charles Harold, Brooklyn Edison Co., Inc., H. P. Liversidge, Philadelphia Electric Company and E. W. Lloyd, Commonwealth Edison Company; Frank Watts, Bennett, Watts & Haywood, Davis DeBard, Stone & Webster Service Corporation, and Joe Busch.

The Chief Executive's Viewpoint Toward a Sales Program

By G. C. Estill

President and General Manager of the Florida Power and Light Company, Miami, Fla.

An address before the First General Session of the Third Annual Convention of the Edison Electric Institute, Atlantic City, N. J., June 3, 1935

FLORIDA POWER & LIGHT COMPANY is comparatively a new company, having been organized in 1925. The territory it serves extends for some 400 miles north and south and 150 miles from east to west. It serves 153 communities, representing a population of approximately 349,000, and had, on Dec. 31, 1934, 74,714 residential customers, 17,216 commercial and industrial customers, and 2254 other customers. If a map of the territory served by the company were superimposed upon the states along the central eastern seashore, its north and south lines would extend from Boston to a material distance beyond Baltimore. In the southern end of the state, its lines, extending east and west, would reach almost from Atlantic City to Wilkes-Barre, Pa., and in the northern part of the state its service area would extend from Boston to Montpelier, Vt.

Its organization consists of the general office, located in Miami, with the necessary department heads, and four division managers in charge of the four geographical divisions of the property. Under these four division managers are 30 local managers and agents. The company's gross electric revenue for 1934 was $9,032,592. Consolidated operating revenues from all services, including operation of its subsidiaries, exceeded $11,500,000 for the same period.

Although Florida conditions may be somewhat unusual, yet, we believe, certain fundamentals must be always kept in mind in order to obtain the maximum in selling utility electric services.

(1) Every business, regardless of its type and kind, to be successful must render the maximum of service or deliver the maximum of merchandise at the minimum cost. This principle gave birth to the chain store, the holding company and the research, advisory, and quantity-purchasing organizations. As applied to the electric utility, it means the lowest possible rates consistent with company solvency. At all times we must be alive to

MR. ESTILL

opportunities of changing, simplifying and reducing unit electric prices—all for the purpose of inducing more use. I believe greater use of electricity by our customers leads definitely and positively to better public relations and public acceptance of the reasonableness of their electric bills.

(2) Large use of electric service is more definitely planted in the minds of our customers today than ever in the history of our industry. This is largely due to the recent large volume of front-page space being given to uses of electricity. This front-page space we could, under no circumstances, have ever bought and paid for, so, for the life of the industry, let's capitalize on this fact. Lots of this front page and radio propaganda is certainly detrimental to our companies, as such; yet this publicity has surely made the public generally desire to use electricity for more services than ever. It has tended to change the residential user to thinking of his monthly utility bill as his "electric bill" rather than his "lighting bill." Therefore, we can best save our companies from Government ownership by taking full and complete advantage of this situation in putting forth more high class sales effort *now* than formerly has been considered good utility practice. Today there are also available to our customers cheaper and better electric appliances than ever before. It seems to me, therefore, that our industry as a whole has the greatest opportunity in its entire history to extend the use of electricity in the home, the retail establishment, and the factory.

(3) The electric utility is primarily in the business of manufacturing, delivering and selling electricity. The selling of electric appliances and the necessary wiring on the customer's premises are secondary and only incidental to selling of electricity itself. The utility is the only one interested in the former, whereas all the contractors and dealers are interested in the latter. The utility must always remember that the only profit possible to the contractors and dealers results from wiring contracts and sales of electric appliances. Therefore, in order to bring about the maximum use of electricity there must be close cooperation on a mutual interest basis between the contractors, dealers and the company, and to a great extent, where practical, the contractors and dealers should handle all inside wiring and appliance sales. In your enthusiasm to get appliances connected to your lines do not sell merchandise at prices and on terms which are so unfavorable to the dealers that they cannot make a legitimate profit. Make available to the dealers the services of your home economists. Make arrangements for the financing of their paper on as good a basis as the company can obtain. Arrange for the dealers a financing plan for selling small appliances costing the customers as low as $2.00. Thoroughly advertise such plan and, based on our experience, results will be surprising. Advertise the convenience of use of electricity and what an appliance will do for the customer rather than advertise the

appliance itself. Always advertise from the customer's viewpoint. Carry a statement on your advertising that appliances may be purchased from the dealer. Make arrangements for dealers to place their merchandise on your display floors. Set your compensation plan for salesmen so they will not be in competition with the dealers. In other words, pay your salesmen on the basis of load added rather than merchandise sold. See to it that your dealers and contractors have their say in formulating the dealer-contractor coordination plan and that your sales organization functions in carrying out this plan exactly as it is written. Do not say one thing and do another.

(4) Selling is mainly psychological. Therefore, the proper mental attitude of the sales organization toward the job to be done is of tremendous importance. The salesmen must understand the difference between selling electric service and selling electric merchandise. The entire company organization must be brought intimately into the sales plan by a system of bonuses for leads on prospects. A large number of the best leads for the major appliances will come from the employees, and, at the same time, they can directly sell small appliances if they are given the proper leadership, instruction, and compensation for such work. Numbers of our employees add materially to their annual pay in this activity; some as high as $500 or $600. The highest was one of our girls who made $712.54 in addition to her regular salary through her sales activity. It is the major duty of the executive, by his actions and word of mouth to make the entire company organization know definitely that selling activity on the part of the sales organization and the employees in general has his entire and active wholehearted support and approval. He must show by his actions and statements that selling is tremendously important. He must often put aside other very important matters for the purpose of giving a sales talk to a group of employees. The management must see to it that any person, whether in the sales organization or not, accomplishing an outstanding sales job gets management approval, congratulations and thanks. Without this active, thoughtful and appreciative management approval of sales effort, the full value of the dollars put into sales cannot be attained. The time the chief executive puts behind sales effort pays. It may be that the study and watching of those routine operating reports can just as well, or better, be handled if delegated to the operating department heads. Based on my own experience, I feel I cannot stress this point too strongly. Maybe the general manager who might feel that he should have a bigger, better sales manager only needs a change in his own attitude toward selling, plus a *real* personal leadership that shows active interest.

(5) Although there are numerous differences between utility business and other businesses, yet the selling of utility service does not differ from the selling of other services and products. The selling of electric service is not different from selling shoes, dresses, socks, or other merchandise. Never let anyone tell your sales organization that the utility business differs from other businesses. As a matter of fact, our business does not differ from other businesses as far as selling is concerned. In addition, it is a foregone conclusion that the customer isn't interested in differences of business economics when purchasing more electricity, so the salesman should not know anything about them. The salesman must sell from the customer's viewpoint. The customer is not interested in how or what comes through the wires to his appliances, but is very much interested in lighting, hot water, cooking, refrigeration, and the many other things the service does for his convenience, satisfaction, enjoyment and profit. The customer knows little or nothing about rates, and, in spite of all the publicity about high and low electric rates, it is believed the customer has little or no interest in cost per kwhr, but does have a tremendous interest in what lighting, hot water, etc., cost him in dollars and cents per month. It is therefore very important that the salesman be thoroughly familiar with all the services performed by electricity for the customer and not waste time talking so-called utility language to the customer. It is not necessary for the salesman to know anything about the utility business; in fact, it is believed he is a better electric service salesman if he is ignorant regarding utility differences.

In the same way all advertising must mesh with this scheme of things and be written entirely from the customer's viewpoint. If the salesman does not have to know the utility business, it is imperative that the advertising copy writer must know nothing about the business so that he can continually keep the customer's viewpoint.

The sales operations of an electric utility should be planned, managed and executed in the same manner as in a successful department or retail store. If you will pick the most prosperous department store in your community and study its operations, you will probably learn the way in which to properly obtain and handle customers for successful results in your electric sales plans.

(6) You must spend money to secure successful selling results. Man-power is needed, and this entails expense. The amount of money to be spent on selling must be determined entirely by how much new business can be obtained by sales effort. Perhaps an expenditure of fifty cents for each new annual dollar of revenue which can be secured is justifiable, maybe more—who knows?

We believe this viewpoint of expense is fundamental and that too often other opinions of it preclude good results from the sales department.

(7) The widespread national use of advertising in itself proves its value to business. We believe, therefore, that we must advertise liberally. If possible, use all media, such as newspapers, radio, billboards, signs, window displays, bill stuffers, and direct mail.

Use advertising written from the customer's viewpoint and based on selling. Forget about so-called institutional advertising. I know you remember—perhaps with some regret—when we all attempted to fill the papers with columns of fine print dealing only with very general generalities.

(8) In your selling see that all phases of the prospective market are being solicited. The uses of electricity are so numerous and varied that we are apt to overlook and entirely neglect a very fertile class of prospects in our enthusiasm to concentrate on some one field. Our sales program is like a six-ring circus, except that there are ten or more rings and they must all be kept going at the same time.

(9) Selection and training of personnel are important. We have found it important that our sales organization be made up generally of young men of the highest intellectual type, well-educated and of pleasing personalities. We select those men who have a good educational background and sincerity of purpose. Then we train them by a carefully planned program looking to the development of proper selling technique and personal contact ability.

Our selling in Florida is based on the fundamentals which I have just outlined. Some statistical data, therefore, will be of interest. I have selected what I believe to be the most generally used statistics that will give a direct comparison with other sales results.

Our sales department includes, in ad-

GEORGE BRUCE CORTELYOU

President of the Consolidated Gas Company for twenty-six years, Cabinet Member under three Presidents of the United States, President of the American Gas Association, President of the National Electric Light Association, first President of the Edison Electric Institute, holder of many honorary degrees from institutions of learning, patron—and in the case of music a practitioner—of the arts, and finally, a genuine humanitarian.

On the occasion of his retirement on July 1st from service as President of the Consolidated Gas Company of New York, the Edison Electric Institute, which enjoyed the benefit of his wise guidance during its first two years of existence, reiterates its great appreciation for the manner in which Mr. Cortelyou administered its affairs during his incumbency.

As President of the Institute he decided all matters with courage and wisdom. He was consulted freely, and his advice was always sound, sincere and thorough. Without the benefit of his knowledge, his understanding, his initiative, his sincerity, and his friendliness, the formative years of the Institute would have been most difficult. To a large degree the credit for the progress of the Institute is due to him.

In the assurance that his usefulness to his fellow-man will continue unabated and that his record will always be an inspiration to youth, the best wishes for the full enjoyment of a well-earned rest from active business life go to Mr. Cortelyou with the affection and esteem of his friends in the Institute.

dition to the general sales manager and other supervisory and clerical employees, 27 commercial sales engineers, 4 lighting specialists, one air-conditioning specialist, and one commercial cooking specialist. This makes one commercial sales engineer for every 507 commercial and industrial customers.

In the residential section there are 38 residential salesmen, or one for every 1840 residential customers, and 20 home economists, or one for every 3498 residential customers.

In 1934 we had a total of 241 dealers and contractors participating in our cooperative merchandising plan, employing 471 salesmen. Department stores and dealers in our territory sell small appliances on an easy payment plan. Such appliances as irons and toasters are financed over a period of months. These sales handled by the dealers are running about 6000 units a month. When this easy payment plan was inaugurated, about 30 per cent of the appliances sold were financed, the remainder of the sales being for cash. This percentage of time payment sales has constantly decreased, although sales have held their own, until at present less than 10 per cent are required to be financed.

Our company uses newspaper, radio and billboard advertising, all of which is devoted to direct sale of electric service. Our advertising department is operated as a branch of the sales department so that all advertising matter may be directly tied in with sales plans and programs. We spend approximately 1¼ per cent of our gross electric revenue for advertising.

As of Feb. 28, 1935, there were connected to our lines a total of 14,540 electric ranges, or 17 ranges for every 100 residential customers; 24,093 refrigerators, or 29 refrigerators for every 100 residential customers, and 3487 water heaters, or 10 water heaters for every 100 residential customers. In other words, our range saturation is 17 per cent, refrigeration 29 per cent and water heaters 10 per cent. Incidentally, this 10 per cent saturation of water heaters is obtained by us on the basis of selling the value of the service to the customer and not upon a basis of price through low off-peak water heating rates. This is also true of the other services as well, and, as I shall point out later, our average residential rate for 1934 was 6.8c. per kwhr.

The low percentages of saturation of the various major appliances throughout the industry prove beyond a shadow of a doubt the tremendous opportunities in

(Continued on page 292)

Union Electric Light and Power Company's 1934 Domestic Load Building Activity and Its Results

By C. E. Michel

Sales Manager, Union Electric Light and Power Company, St. Louis, Mo.

An address before the First General Session of the Third Annual Convention of the Edison Electric Institute, Atlantic City, N. J., Monday morning, June 3, 1935

IN ORDER to avoid the possibility of erroneous conclusions, a discussion of the domestic load building activities of the Union Electric Light and Power Company for the year 1934 must necessarily include a brief statement of the long range plan on which that activity was founded. Briefly, it is as follows:

In the year 1916, we served a total of 88,000 customers of all classes and our residential customers used an average of 258 kilowatthours per year, for which they paid an average rate of 6.6 cents per kilowatthour. During the previous six years, this rate had been reduced from an average of 12 cents a kilowatthour. A large number of small, limited use customers were connected during the period, with the result that the average yearly consumption for all residence customers had actually decreased by 40 kilowatthours.

In view of this trend and the very low rate level, it was obvious that an aggressive load building operation was necessary, for our experience clearly indicated that low residential rates in themselves did not build load. Incidentally, subsequent events have but confirmed that conclusion in so far as we are concerned.

To this audience it is hardly necessary to point out that in those days the utility sold electric appliances or they simply were not sold, and while from the beginning we had conducted an active merchandising business, it was in that year we overhauled our activities, set them up on an enlarged scale and aggressively went after volume. During the next five years, appliance sales improved rapidly, the average annual use of our residence customers jumped to 410 kilowatthours, and a modest over-the-counter demand for appliances developed; the business had reached proportions that attracted the attention of enterprising merchants in the territory and our sales plans were the subject of discussion and criticism. With the assurance of active sales effort on the part of a substantial

MR. MICHEL

number of dealers, in November, 1921, we launched an activity calculated to improve the dealers' competitive position.

Time will not permit of even a brief outline of that activity, but it is interesting to note that in its presentation was included a statement of its purpose, of the utility's place in the picture, and of the sales policies that would henceforth govern our merchandising activity—as sound today as the day they were written. Activities have, of course, been broadened and the cooperative group of about 800, more closely knit, but with the exception of the elimination of the premium method of forcing sales, the plan still governs the St. Louis activity.

In April, 1931, we set up our first cooperative sales unit—the St. Louis Electric Refrigeration Bureau. It was a success from the start and in 1932 won the first award for local bureaus in the Half Century Contest as conducted by the National Electric Light Association. Our experience with that bureau taught us many valuable facts, not the least of which was that cordial cooperation between a utility engaged in merchandising and the dealers in the territory handling such merchandise, followed the proper organization and operation of such a unit and that sharply increased sales attended that happy state of affairs.

In July, 1932, we set up the St. Louis Air Conditioning Bureau; in December of the same year, the St. Louis Electric Cookery Council. These, with the electrical contractor and dealer groups organized some years before, gave us five smoothly operating organizations working toward a common goal. In 1933, the James H. McGraw Medal for cooperation came to St. Louis as a result of the work done by these groups.

It was with this background that in November, 1933, we organized for the 1934 activity. In that month we announced a reduction of $1,300,000 in our rate for domestic service, and after extensive and appropriate publicity on this fact, decided that business could best be built by translating the reduction in rate into the low cost of operating appliances in the home, and selected that as the theme around which to build appliance business for every worthy outlet in the district, as well as our own much needed increase in kilowatthour sales.

The first move was the selection of a nationally known advertising council with whom we worked out the publicity plan. For some time we had been publishing an informative bulletin known as *The Electric News*. Its circulation of approximately 1000 was among the dealers who were handling, or could to advantage handle, electrical appliances; its purpose was to keep the dealers informed on such things as new developments in appliances, the seasonal movement of the merchandise, the ever changing customer acceptance and demand, and the resulting opportunities for additional sales. It was decided to use this medium to announce and fully explain the campaigns to follow.

The year 1934 was divided into four periods, for each of which we set up a

cooperative publicity and merchandising campaign on the particular merchandise best lending itself to special promotion during each period, and information on the campaigns was released to the dealers at the beginning of each period.

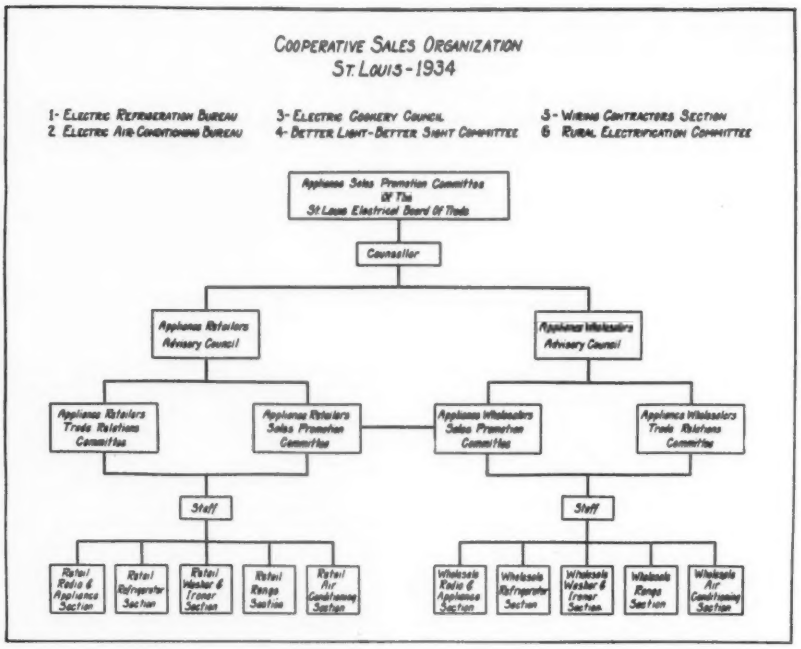
The publicity campaigns included the daily press, radio and bill boards. Obviously there was need for supporting material to tie the dealer's store into the campaigns. We produced and furnished the dealers window display cards, store display cards, appliance cost tags, appropriate folders and booklets on the low cost of operating appliances in St. Louis.

The first radio campaign was built around a half hour radio show presented at 9:00 p.m. once each week for thirteen weeks and announced as sponsored by 700 St. Louis electric appliance dealers and contractors. Each dealer was supplied with a book of tickets which, when signed by him, admitted his family, employees and customers to the studio so that they might enjoy the fun and excitement of watching a big radio show actually go on the air. The attendance at these shows was satisfactory, running as high as 330 in a single evening. After the first thirteen weeks, the broadcasting campaign was confined to spot announcements.

The second move was the employment of a sales promotion manager with broad advertising and promotion experience. His duty was the conception, organization and execution of special activities with the different bureaus. The prime objective of this operation was the bringing of customers into the dealers' stores, and it is interesting to know that on the last refrigeration operation more than 29,000 prospects registered in the dealers' stores for a prize drawing that took place later and necessitated a second visit to the store at the time of the drawing. 16,600 registered under a somewhat similar campaign sponsored by the Electric Cookery Council. All details of these operations were worked out in mass meetings with the distributors and dealers.

The third move was the employment of a merchandising counsellor, a man with years of experience in dealer contact work in the St. Louis area. His prime duty was to be of assistance to the small dealers in solving the problems incident to the transitional stage from passive to aggressive selling.

Then, on November 2, 1933, we called a dinner meeting, at which the dealers in the district were our guests. More than 700 attended and heard the story in detail. Following, dinner meetings were held of related groups, such as the different bureau groups, and to each of these we explained the plans of particular interest to the group; full discussion was had, advice solicited, appropriate changes made and the meetings adjourned only after the group was in substantially unanimous agreement.


Cooperative Sales Organization
St. Louis - 1934
1- Electric Refrigeration Bureau
2 Electric Air-Conditioning Bureau
3- Electric Cookery Council
4- Better Light-Better Sight Committee
5- Wiring Contractors Section
6 Rural Electrification Committee
Appliance Sales Promotion Committee Of The St Louis Electrical Board Of Trade
Counsellor
Appliance Retailers Advisory Council
Appliance Wholesalers Advisory Council
Appliance Retailers Trade Relations Committee
Appliance Retailers Sales Promotion Committee
Appliance Wholesalers Sales Promotion Committee
Appliance Wholesalers Trade Relations Committee
Staff
Staff
Retail Radio & Appliance Section
Retail Refrigerator Section
Retail Washer & Ironer Section
Retail Range Section
Retail Air Conditioning Section
Wholesale Radio & Appliance Section
Wholesale Refrigerator Section
Wholesale Washer & Ironer Section
Wholesale Range Section
Wholesale Air Conditioning Section

Slide 1

There followed two important meetings of the jobbers and their salesmen and this group played a highly important part in such success as attended the 1934 operation, for it was through it we contacted every dealer in the district in his own place of business and sold him directly on the cooperative campaign about to break, his place in the picture, and what he must do in his own store and with his own sales force in order that he might cash in on the campaign. Subsequently, our own salesmen contacted the dealers, assisted them in dressing their stores and show windows and in making the most effective use of the display material and literature we furnished.

Within the limited time allotted, I can give you no details of this operation. I have, however, reproduced on slides certain pertinent information that, with your permission, I will now present. (Editor's Note: These slides are reproduced herewith.)

Slide No. 1—Cooperative Sales Organization.

The first slide is a graphic picture of the cooperative sales organization built up through the years. It was this organization that did the 1934 job in St. Louis. Somewhat over 400 men go to make up the several bureaus and committees. As counsellor of the organization, its operation has been my responsibility and I have delegated it to no one, but have personally attended and handled all but the most informal meetings. You will note that there is a direct tie-in between the Sales Promotion Committee of the Wholesalers and the Retailers Sections. While all other operations of the group can be successfully handled separately, these two committees, we have found, must necessarily work together if effective work is to be done.

Slide No. 2—Is a reproduction of the cover of a Special Edition of *The Electric News*.

Our experience has taught us that one of the most important things we have to do is to see that all of the wholesalers and retailers thoroughly understand each operation before it starts; otherwise complaints arise and sales are retarded. Much time is put into the preparation of this medium and it is not distributed until after a mass meeting has been held and preliminary information given and discussed.

Slide No. 3—We attempt to get something of extraordinary interest in each issue, and this slide shows a headline sample page announcing our plan to carry dealers' deferred payment paper on our electric bills.

Special SPRING Edition
THE ELECTRIC NEWS
OUT OF THE RED...
INTO THE BLACK!
THE MOST IMPORTANT EDITION OF THIS PUBLICATION EVER ISSUED

Slide 2

NOW SAY "CHARGE IT ON YOUR UNION ELECTRIC BILL"
We are going to carry your deferred payments on approved appliances. This does not mean we will finance your paper. We will put the monthly payments on our Union Electric bills if your customer is also a Union Electric residence customer . . . we will collect the money and remit to you. This is a collection service, not a financing plan. No red tape. Everything is simple. Here's how it works:
WHAT YOU DO

Slide 3

Slide 4

Slide No. 4—Is another of these pages, reproduced primarily to emphasize the manner in which we promote the jobber and the distributor. If these branches of the industry lay down on an operation of this kind, it is an almost hopeless task to make it a success.

Slide No. 5—Is a page from a special issue on the electric range, urging the dealer to tie in through the use of display material.

We have sold electric ranges in St. Louis for a great many years, as high as 1600 in a single year, but have reached the conclusion that there will not be a steady sale of this type of merchandise until such time as a substantial retail-distributing organization is built up. Last year we sold but 661 electric ranges. The important point, however, is that 331 of these were sold by dealers, and that is more electric ranges than all the dealers have sold in St. Louis in the last twenty years. The movement is gaining momentum. In the first five months of 1935 more ranges have been sold than were sold during the entire year of 1934, and 42 dealers have sold approximately one-half of these; our company accounting for the balance.

Slide No. 6—Is another of these specials on the subject of electric refrigeration and well illustrates the importance we feel of specific recommendations to the dealers as to how to tie in.

In the year 1934, 30,166 electric refrigerators were sold in the territory served by my company. We sold but 4 per cent of these and are perfectly satisfied with that volume. The saturation in the territory is now well above 50 per cent.

The slides that follow illustrate the type of newspaper advertising used. In general there are 1500 lines or over. Several are full-page advertisements. In commenting on these I think it is interesting to know that Union Electric Light and Power Company's 1934 advertising was awarded first place by the Society of Typographic Arts of Chicago.

Slide No. 7—Is an Electric Refrigeration Bureau ad run over the name of the Electrical Dealers and Contractors.

Slide No. 8—Is an advertisement by the Air Conditioning Bureau, drawing attention to the exhibit at Union Electric Building, which operates throughout the year and displays air conditioning equipment offered by all of the distributors in the St. Louis territory.

Slide No. 9—Is a full-page advertisement by the same bureau promoting the sale of room coolers.

In 1934 almost as many air conditioning installations were made in the St. Louis territory as had been made in all previous years, and 70 of these installations were in residences. So far in 1935 we have doubled the number of installations made during the same period of 1934.

Slide No. 10—Is a sample of our Cookery Council advertising. It is of particular interest as it shows the manner in which the dealers are injected into the picture.

Slide No. 11—Is an ad by the Electrical Dealers and Contractors of St. Louis and Vicinity, tying in with the Table Cookery Activity.

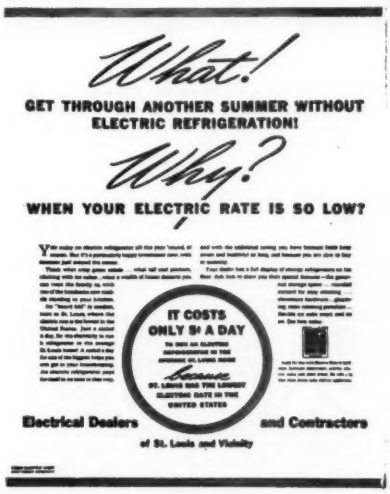
Slide No. 12—Is a type of general ap-

50,000 women with a NEW IDEA of the merit of Electric Cookery
50,000 women with FREE PRIZE CERTIFICATES in their hands...What will they do?
They have been told to look for the store with the PRIZE DRAWING DISPLAY in the window... and that's just what they'll do. They'll look for YOUR store if YOU have the display in the window

Slide 5

CHECK THESE STEPS
What the ELECTRIC REFRIGERATION BUREAU Does:
1. DISTRIBUTES 250,000 Prize Certificates — one to each home — through the Electric Meter Readers.
2. BROADCASTS a daily Radio Announcement.
3. HANDLES your Mail Invitations to prospects, at low cost.
4. PROVIDES you with attractive Window and Store Display Material, Registration Blanks and other helps described in this book.
5. DISTRIBUTOR MEMBERS supply the Prize Electric Refrigerators, latest models of each make, without cost to dealers or winners.
What YOU Do:
1. DISPLAY the Prize Electric Refrigerator (the make you handle) in your window and in your showroom.
2. DECORATE your window and store with the material furnished, plus suitable decorations of your own.
3. PROMOTE your store as Headquarters for Registration
—by Mail Invitations to prospects;
—by Telephone Invitations to prospects;
—by Personal Invitations to prospects through your salesmen;
—by Advertising your special Spring Display in your regular newspaper space.
4. REGISTER every possible prospect
—first as an entrant in the Prize Drawing; also as a prospective buyer, to be followed up, worked on and closed by YOU during the Spring Display or soon afterward.
5. COOPERATE fully with your Distributor and the Bureau, so that a triumphant new sales record can be achieved during this period by everyone concerned. Remember, your "Spring Display" should be a real display. By making callers feel at home and by conducting demonstrations of genuine interest YOU are sure to CASH IN on the general program.

Slide 6


What!
GET THROUGH ANOTHER SUMMER WITHOUT ELECTRIC REFRIGERATION!
Why?
WHEN YOUR ELECTRIC RATE IS SO LOW?
IT COSTS ONLY 9¢ A DAY
ST. LOUIS HAS THE LOWEST ELECTRIC RATE IN THE UNITED STATES
Electrical Dealers and Contractors of St. Louis and Vicinity

Slide 7

AIR CONDITIONING
ROOM COOLING
Air Conditioning • Room Cooling
EXHIBIT
at the
UNION ELECTRIC BUILDING
12th Boulevard & Locust St.
Come and see the first display of practical ROOM COOLING units. Learn how you can avoid the distressing effects of Summer HEAT and HUMIDITY—at home, in the office, shop or store. Prevent discomfort, loss of energy, illness • NOTHING SOLD AT THIS EXHIBIT
ST. LOUIS
Air Conditioning
BUREAU

Slide 8

pliance promotion advertising we have found to be quite effective.

Slide No. 13—Is a particularly attractive radio advertisement, stressing the low cost of operation and urging the customer to modernize his radio installation.

Slide No. 14—Is one of a series of tie-ins with the "Better Light-Better Sight" movement, promoting primarily the op-

Women Are Tired of Cooking in Hot Kitchens
See One of These Dealers TODAY!
ST. LOUISANS SHOW INTENSE INTEREST IN ELECTRIC RANGE DISPLAYS BY 100 LEADING STORES
Special Displays
Cool Electric Cookery
Visit Convenient Store Now
Costs Less
ELECTRIC COOKERY COUNCIL

Slide 10

Do these four live at your house?
They should!
Drudgery is old fashioned!
ELECTRICAL DEALERS and CONTRACTORS of ST. LOUIS and vicinity

Slide 12

98°
99°
102°
108°
BE COOL INDOORS
wherever the mercury leaps
One of the new ROOM COOLERS will bring you summer health and comfort
VISIT THIS EXHIBIT
AIR CONDITIONING BUREAU of St. Louis
3 REASONS WHY you should have an Air Cooled room or office NOW

Slide 9

It's FUN to cook electrically, right at the table
JUST A FEW CENTS A MONTH
ELECTRICAL DEALERS and CONTRACTORS of ST. LOUIS and vicinity

Slide 11

THE GREATEST SHOW IN THE WORLD!
A penny a night admits the whole family
ELECTRICAL DEALERS and CONTRACTORS of ST. LOUIS and vicinity
TUNE IN

Slide 13

Children can't!

Poor light is a terrible strain on the eye lens and muscles that move young eyes.

Children who are straining their eyes trying to see are tired and nervous. And poor light is one of the causes of the damaged eyes-sight which one out of every five school children has. The number steadily mounts, till fifty per cent are wearing glasses — as should be — at the end of college days.

You can guard against it with so little trouble, so little expense. Have the right amount of light, and the right kind of light in your home. Not one home in ten does that — and it benefits everybody on the family!

There are wonderful new lighting fixtures and portable lamps, scientifically designed for eye comfort and to help eyes develop normally. The electricity they use adds scarcely anything to your bill — especially in St. Louis, where electricity is cheap.

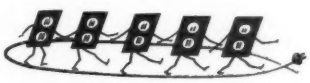
Your dealer has them to show you. Look at the useful little Push-It-Up Lamps that you can hang on a sill or any dark spot. And look at the new table and floor lamps that are certified by leading authorities. They are called the I E S Better Sight Lamps. That stands for Illuminating Engineering Society. They are decorative, inexpensive and a marvelous scientific development.

One of our Lighting Experts will call and tell you what correct home lighting means. Her services are free. She has nothing to sell. But the suggestions you get from her will help you protect your children's vision.

THESE ARE THE I E S BETTER SIGHT LAMPS

UNION ELECTRIC LIGHT AND POWER COMPANY

Every day is bargain day
at your electric meter



. . . and right now *there are bargain prices on the new electrical outlets you need!*

THE Electrical Contractors of St. Louis and vicinity are now offering a special low price for the installation of additional electric outlets in homes. All you have to do is to telephone your Electrical Contractor or select one in the neighborhood. Without obligation, he will be glad to make suggestions and quote you a special low price for the work.

Now that St. Louis has the lowest residence electric rate of any city in the United States, thousands of families want to use this cheapest of servants more and more.

They know that the convenience and comfort of their homes depends a great deal on the number and location of electric outlets. They want plenty of outlets for everything, enough so that all electrical things will be handy to use, no more putting up with make-shift wires from ceiling chandeliers and trailing all over the floor.

SPECIAL LOW PRICE

Get the outlets you need for convenient use of your cleaner, heater, percolator, iron, food mixer, floor lamps and the countless other time-saving, work-saving electrical aids. And get them at the new low price your Electrical Contractor will quote you.

Outlets can be installed with little disturbance or annoyance to you. No dirt. No disorder. No destruction of wallpaper or woodwork. No hurry, either, about paying for the work all at once; you may divide over a year's time on your electric bill. Your contractor will arrange for that.

Act now, while the special low price for this work is in effect.

ELECTRICAL DEALERS *and* CONTRACTORS *of* ST. LOUIS
and vicinity

UNION ELECTRIC LIGHT AND POWER COMPANY

TUNE IN [illegible] Theatre at 8:30 P.M. on KMOX and WIL

**MORE WORK DONE..
NO EXTRA CHARGE**

Supposing that, in 1885, you lived in a St. Louis home with five counted rooms and used 70 kilowatt hours of electricity every month. Then you paid $3.50 a month for it.

And that was among the lowest electric rates in the country.

This year, living in that same house, using that same amount of electricity, you pay only $2.42 for it, thanks to Union Electric's new low rate.

Here's what the $1.17 you save will bring you in the way of more electric help.

For the whole month it will:
Do the laundry with an electric washer and ironer
Run your vacuum cleaner
Run your radio
Give you correct time from an electric clock
Make waffles twice a week
Make toast every day
Make coffee every day.

All that work—no extra charge. Because *Electricity is cheap in St. Louis.*

UNION ELECTRIC LIGHT AND POWER COMPANY

HERE'S WHAT SOME DEALERS DID, THE FIRST HALF OF 1934

We have said that the first six months of this year made a record in the sale of electric appliances. For instance, the St. Louis Electric Refrigerating Bureau, reporting for all wholesalers doing business in the territory, have released the figure of 22,497 electric refrigerators as having been sold January 1 to August 31. This is a new all-time high record for the sale of refrigerators in your territory.

We have some interesting figures on the percentage of increase for the first half of 1934 over 1933 reported to us by the sellers of electrical appliances in the St. Louis district. We want to print a few of these figures—to show you what we mean when we say improvement. Of course we are not at liberty to give names of the firms involved, but in the aggregate they sell a large volume of electrical appliances.

EXAMPLES OF WHOLESALERS' PERCENTAGE OF GAIN		EXAMPLES OF RETAILERS' PERCENTAGE OF GAIN	
MAJOR APPLIANCES	SMALL APPLIANCES	MAJOR APPLIANCES	SMALL APPLIANCES
80%	231%	178%	46.8%
70%	—	46%	8%
		72.5%	30%
66⅔%	40%	187%	66⅔%
		10%	80%
360%	20%	78%	38%
47.78%	41.6%	108.33%	—
		68.3%	100%
21%	30%	73%	—
		183%	90%
130%	58%	90%	—
72.8%	—	—	201%

UNION ELECTRIC LIGHT AND POWER CO
INCREASE IN APPLIANCE SALES

UNITS SOLD 1934 OVER 1933

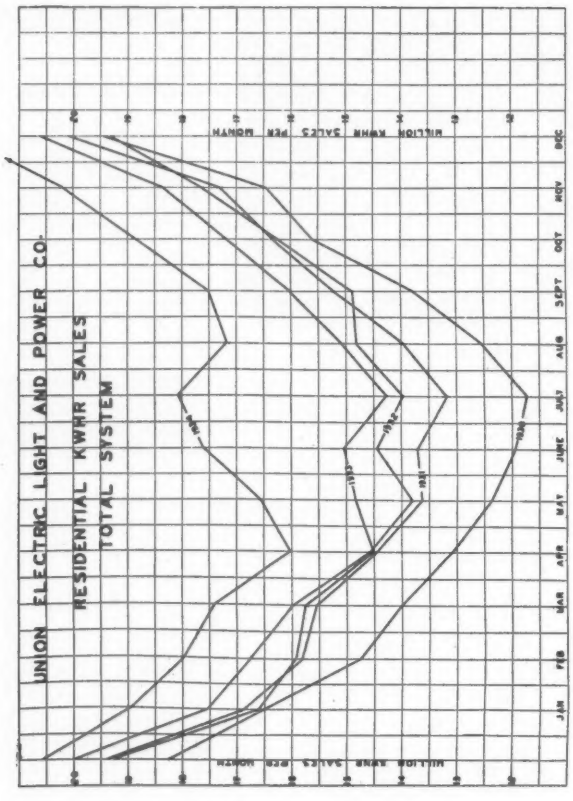
APPLIANCE	PERCENT INCREASE
COOKERS	34·5 %
RADIATORS	99·7
TOASTERS	59·2
WAFFLE-IRONS	42·6
PORTABLE LAMPS	58·6
WASHERS	39·3
IRONS	18·8
REFRIGERATORS	27·3
DISC STOVES	13·3
PERCOLATORS	72·5
FOOD MIXERS	35·3
IRONERS	57·1
RANGES	80·0

Left—Slides 14, 15, 16. Above—Slides 17 and 18

INCREASE IN RESIDENTIAL BUSINESS
YEAR 1934 OVER 1933

	YEAR 1933	YEAR 1934	INCREASE NUMBER	INCREASE PERCENT
AVERAGE ANNUAL KWHR CONSUMPTION PER RESIDENCE CUSTOMER				
METROPOLITAN ST LOUIS	753.39	823.90	70.51	9.4%
OUTLYING TERRITORY	499.28	548.29	49.01	9.8
TOTAL SYSTEM	708.45	775.11	65.66	9.3
INCREASE IN TOTAL RESIDENTIAL KWHR SALES				
METROPOLITAN ST-LOUIS	169,267,775	189,528,908	20,262,133	12.0 %
OUTLYING TERRITORY	23,450,467	27,127,855	3,677,388	15.7
TOTAL SYSTEM	192,718,242	216,657,763	23,939,521	12.4
INCREASE IN RESIDENCE CUSTOMERS SERVED				
METROPOLITAN ST-LOUIS	226,734	238,451	3,717	16 %
OUTLYING TERRITORY	46,145	50,547	2405	5.0
TOTAL SYSTEM	276,879	282,998	6,119	2.2

Slide 19


UNION ELECTRIC LIGHT AND POWER CO.
RESIDENTIAL KWHR SALES
TOTAL SYSTEM
MILLION KWHR SALES PER MONTH
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

Slide 21

eration of our staff of home lighting experts.

Slide No. 15—Is a wiring contractor promotion advertisement.

Under arrangements with the St. Louis contractors, those contractors who agree to put on a salesman to contact the public in an effort to sell additional wiring are authorized, by proper authority, to pay an hourly wage somewhat under the regular schedule, for additional wiring in the home, and our company finances the wiring for the contractor and bills the customer in twelve monthly installments.

Slide No. 16—Is a type of smaller advertisement which, as you will see, not only stresses the reduced cost of electric service in the home, but translates the saving into service that saving will pay for. We have received favorable reaction from our customers on this series.

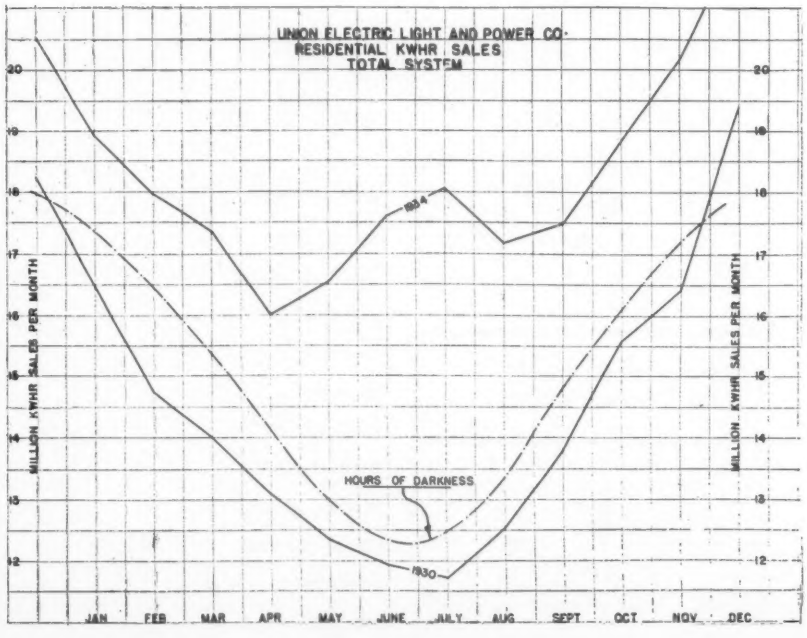
The slides that follow give a measure of the success of the operation.

Slide No. 17—Is a page clipped from the October, 1934, issue of *The Electric News,* announcing to the St. Louis fraternity percentage increase in appliance sales by certain of the wholesalers and retailers. All major outlets are covered in this statement.

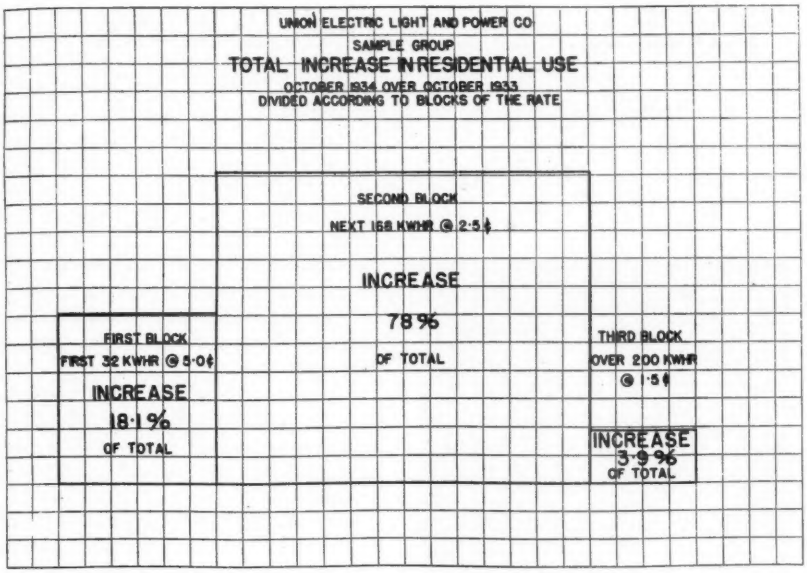
While no detailed figures on the gross increase in the territory on individual items can be given, those figures covering our own appliance sales are available, and the next slide gives these percentages.

Slide No. 18—Shows the percentage increase in appliance units sold in 1934 over 1933.

If appliances have been sold in increasing quantities as indicated by the


UNION ELECTRIC LIGHT AND POWER CO.
RESIDENTIAL KWHR SALES
TOTAL SYSTEM
1934
HOURS OF DARKNESS
1930
MILLION KWHR SALES PER MONTH
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

Slide 20



Slide 22

last slides, 17 and 18, then our kilowatthour sales to domestic customers should reflect that fact.

Slide No. 19—Amply confirms the reports made to us by jobbers and dealers.

These 24,000,000 additional kilowatthours at the average net rate earned by our residence customers during the year 1934 produced an additional revenue of approximately $850,000. The actual revenue from these additional kilowatthours we know was substantially over $900,000.

The next two slides, to my mind, reproduce two of the most interesting charts with which I am familiar.

Slide No. 20—Shows the distribution by months of the year 1933 and 1934 of the kilowatthours sold to our residence customers. It will be noted that the 1930 sales follow very closely the hours of darkness, as charted by the dotted line; whereas in 1934 the effect of the use of appliances in the homes has bent the curve until, for instance, in July, 1934, we sold our residence customers better than 18,000,000 kwhr; in the same month of 1930 the sales were just slightly over 11,000,000 kwhr. We have taken a big bite out of the summer residential sales valley in St. Louis.

Slide No. 21—Charts the same information for the years 1930 to 1934 inclusive and is reproduced in order to illustrate the marked improvement that occurred in 1934. It will be seen that the 1934 record is about equal to the sum of the records made during the previous three years.

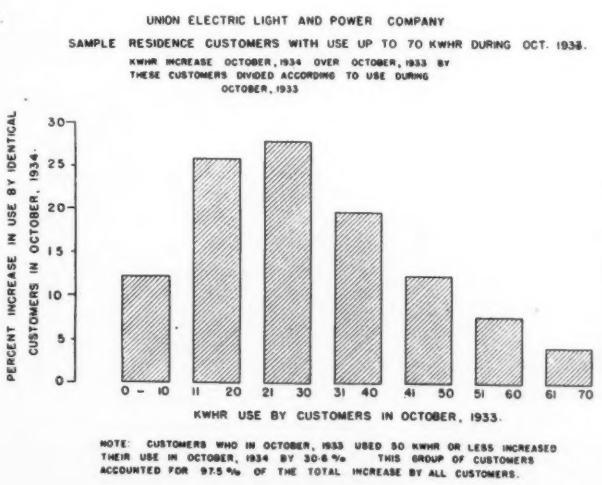
Discussion of the unprofitable residential customer has occupied our attention for some years. By some it has been stated that a customer using less than 40 kwhr a month should be placed in this class. In an effort to determine the distribution of the additional killowatthours sold by us during the year 1934, we took about a 10 per cent sample of our residential customers, and the next three slides, with which I will finish, show what happened to this group during the year 1934.

Slide No. 22—Indicates that in this sample group 18.1 per cent of the increased use in kilowatthours fell under the first block of the rate, which covers the use of 32 kwhr per month; that 78 per cent fell under the second block, which covers the next 168 kwhr; and 3.9 per cent under the third block, over 200 kwhr.

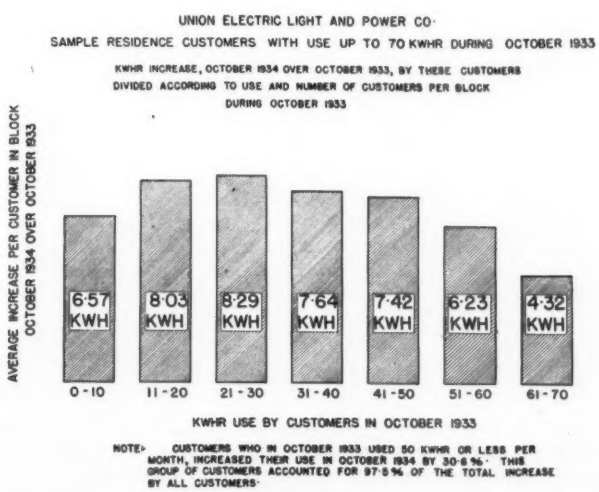
Slide No. 23—A further breakdown of the use by these sample customers is shown on Slide No. 23. The vertical coordinate shows the per cent increase, by these customers, grouped according to kilowatthour use in October, 1933.

Further analysis shows that the group of customers using 50 kwhr or less in October, 1933, increased their use by 30.6 per cent in October, 1934, and that this group accounted for 97.5 per cent of the total increase by all customers in the sample group.

Slide No. 24—And the last one—gives the average kilowatthour increase per customer per block, October, 1934, over October, 1933. The largest increases, you will see, fell in the blocks from 11 to 30 kwhr per month.


UNION ELECTRIC LIGHT AND POWER COMPANY
SAMPLE RESIDENCE CUSTOMERS WITH USE UP TO 70 KWHR DURING OCT. 1933.
KWHR INCREASE OCTOBER, 1934 OVER OCTOBER, 1933 BY THESE CUSTOMERS DIVIDED ACCORDING TO USE DURING OCTOBER, 1933
PERCENT INCREASE IN USE BY IDENTICAL CUSTOMERS IN OCTOBER, 1934
30
25
20
15
10
5
0
0 - 10
11 20
21 30
31 40
41 50
51 60
61 70
KWHR USE BY CUSTOMERS IN OCTOBER, 1933.
NOTE: CUSTOMERS WHO IN OCTOBER, 1933 USED 50 KWHR OR LESS INCREASED THEIR USE IN OCTOBER, 1934 BY 30·6 % THIS GROUP OF CUSTOMERS ACCOUNTED FOR 97·5 % OF THE TOTAL INCREASE BY ALL CUSTOMERS.

Slide 23


UNION ELECTRIC LIGHT AND POWER CO.
SAMPLE RESIDENCE CUSTOMERS WITH USE UP TO 70 KWHR DURING OCTOBER 1933
KWHR INCREASE, OCTOBER 1934 OVER OCTOBER 1933, BY THESE CUSTOMERS DIVIDED ACCORDING TO USE AND NUMBER OF CUSTOMERS PER BLOCK DURING OCTOBER 1933
AVERAGE INCREASE PER CUSTOMER IN BLOCK OCTOBER 1934 OVER OCTOBER 1933
6·57 KWH
8·03 KWH
8·29 KWH
7·64 KWH
7·42 KWH
6·23 KWH
4·32 KWH
0-10
11-20
21-30
31-40
41-50
51-60
61-70
KWHR USE BY CUSTOMERS IN OCTOBER 1933
NOTE: CUSTOMERS WHO IN OCTOBER 1933 USED 50 KWHR OR LESS PER MONTH, INCREASED THEIR USE IN OCTOBER 1934 BY 30·6 %. THIS GROUP OF CUSTOMERS ACCOUNTED FOR 97·5 % OF THE TOTAL INCREASE BY ALL CUSTOMERS.

Slide 24

The Electric Kitchen as a Load Builder

By P. B. Zimmerman

Head of Appliance Division, General Electric Company, Cleveland, Ohio

An address before the First General Session of the Third Annual Convention of the Edison Electric Institute, Atlantic City, N. J., June 3rd, 1935.

DOMESTIC electrical customers are divided into two distinct classes—the low-income market and the better-income market. The first, or low-income family, represents approximately 40 per cent of the electrical customers and uses little beyond lighting as a service. At present this customer cannot be sold a complete electric service, but will take that portion of it which includes electric refrigeration—if offered through an appliance that has low price, economical operation, and long life.

The better-income market, representing 60 per cent of the electrical customers, is now receptive to a more complete electric service in the home. All must look to this market for the great increase in domestic load.

Much progress has been made by exploiting individual appliances in cooperation with the trade. This work needs little additional promotion, as the trade is active in the sale of those products for which the utilities and the manufacturers have created a public acceptance.

However, in considering further promotion of the complete electrification of the home, we must agree that it has good educational value, but we are not selling anything specific. The exploitation of an electric home is as indefinite as attempting to sell electric current. People do not buy electric current—they buy comfort, convenience and the added time which it affords. Wouldn't the ideal new business venture be one that offers not only a new product—the greatest contribution to the modern home—but with this an outlet which would utilize several times the present output of electrical energy?

Fortunately, the electrical industry has this ideal new business opportunity if it will only concentrate a short time on the promotion of an idea with the domestic customer. This new idea is the complete electric kitchen. Some will immediately say that we have had electric kitchens for years. Yes, it is true we have had pictures of pretty kitchens, but they have never been installed because we have continued to sell individual appliances with no real regard for their relation to one another, or for a complete service in the kitchen.

MR. ZIMMERMAN

What I am now proposing is the promotion and sale of complete electric kitchens—tailor-made for each home. Among the advantages of this program to the customer are the following:

The workshop of the home is the kitchen. In the non-electrical kitchen the housewife is expending more hours of manual labor than are permitted under the NRA code for any industry. Assuming that human servants are beyond her means, she can relieve herself of drudgery and enjoy the untiring efforts of electrical servants for only a few cents each day.

The electric kitchen is planned to cut the hours of kitchen labor in half.

The electric kitchen is more sanitary than any other.

The electric kitchen produces food that tastes better.

The electric kitchen with its uncontaminated air is a more healthful work room.

The electric kitchen is safe.

The electric kitchen protects food in its refrigerator, saves food shrinkage in its range, and reduces dish breakage in its dishwasher.

The electric kitchen with all its servants can be operated for approximately $2 a week.

The electric kitchen costs as little as a cheap car; and the best kitchen, no more than a good car.

The electric kitchen gives the housewife the satisfaction of employing in her workshop equipment as scientifically designed as any in her husband's laboratory or factory.

The electric kitchen adds romance to the food service of the home. Its beauty makes it a joy to the family, its attractiveness makes it a center of entertainment—a guest-room.

Among the advantages of the electric kitchen to the utility are these:

1. The customer with a complete tailor-made electric kitchen is the happiest and most satisfied user of electricity.

2. The electric kitchen customer will employ 5000 kwhr of energy per year, as against the general average of 600.

3. The electric kitchen customer is equal to eight average domestic customers.

4. The electric kitchen with its many appliances gives the most diversified and dramatic demonstration of the flexibility of electric service.

5. The electric kitchen inspires others to a more complete electric service.

6. The electric kitchen is within the means of at least 25 per cent of the electric customers.

7. Thousands of customers who have installed electric kitchens give testimony to the value of a completely equipped and well-planned kitchen. Many thousands of others are receptive to this new labor-saving service, but must see the complete product and have a demonstration to convince them that it will fit their needs.

We are too prone to sell our appliances as merely utility articles, and not give ourselves the opportunity to enjoy the benefit of a greater public interest generated by the colorful ensemble of the complete electric kitchen.

Automobiles are, to a large extent, sold on body styling. Think how that market would be limited if the automobile people had persisted in selling chassis and letting the customer go elsewhere to buy a body. The great replacement business

enjoyed by the automobile industry today isn't because of worn-out automobiles, but because the new styles have a glamorous appeal and render obsolete the car of yesterday.

The major load-building appliances, when grouped in a well-styled, colorful and attractive kitchen, become a unit—and as a body it not only has eye-appeal but something which approximates sex appeal, as does the modern motor car.

The exploitation of the electric kitchen demands the whole-hearted endorsement and support of the utilities and a cooperative sales effort on the part of manufacturers, utilities, and dealers locally. The idea needs greater national publicity and local demonstration and sales service. To start this program of market development, the following may be in order:

The establishment of an Electric Kitchen Bureau by the Edison Electric Institute sponsored by a chief executive of the utility industry.

The Electric Kitchen Bureau should be staffed with several capable men who will take the kitchen story to the electrical clubs or leagues which were formed as a part of the electric refrigeration promotion.

The Electric Kitchen Bureau would assist magazines in collecting material for their articles on modernizing the workshop of the home.

The Electric Kitchen Bureau would assist the local leagues in establishing a kitchen planning service, so that inter-

(Continued on page 294)

Kitchen Modernizing Program Taking Root

Whitwell to Head National Bureau

THERE has been under advisement for several months the development of a National Promotional Program on the Electric Kitchen. The major portion of the electric energy used in the home comes through kitchen equipment.

The kitchen is the one corner of the average home where least attention has been given to modernization and improvement, and yet the woman who does her own work is obliged to spend many hours out of her day there. The home workshop should be made a more efficient place for accomplishment through the planning and placing of electrical equipment, and auxiliary helps.

The kitchen merits the spotlight because there is opportunity to perform a social service for home betterment, tying-in with the Government's Better Housing Program. From the commercial side, promotion of Kitchen Modernization makes it possible for the electric utilities to sell kitchen equipment in a "package"—the refrigerator, range, dishwasher, water heater, mixer, clock, lighting, wiring, and miscellaneous kitchen items. All manufacturers of such equipment have one of those golden opportunities to join in with the utilities in a national promotional effort, based on similar organizational lines to the highly successful Electric Refrigeration Bureau. They have expressed definite interest at a meeting called by Mr. C. E. Greenwood, Commercial Director, Edison Electric Institute, for preliminary discussion of the plan.

Mr. George E. Whitwell, vice-president of Philadelphia Electric Company, presided. He brought out that the interest of industrial groups outside of the electrical family, all concerned in equipment of a modern kitchen, had been manifested. He emphasized that a program of this kind made possible the coordination of active interest of a formidable group in obtaining a common objective. A plan of activity is now being written for early presentation at another joint meeting.

As this issue goes to press, definite announcement is made of the formation of the National Kitchen Modernizing Bureau. Mr. Whitwell has accepted the chairmanship of the Bureau and will shortly call interested groups together for final organization.

Conference group of twenty-eight representatives of the staff of National Electrical Manufacturers Association, Edison Electric Institute, Refrigeration and Range Manufacturers and leading utility executives, who met at luncheon at the Hotel Traymore, Atlantic City, N. J., June 3, 1935, to discuss a national promotional program on kitchen modernizing.

Electric Fences: A Word of Warning

A PRACTICE has recently been noted which consists of the "fencing" of fields or pastures by the use of a wire charged with electricity at the ordinary secondary voltage available at farms and dwellings—that is, approximately 115 volts to ground. Some of these devices consist of single wires on short posts and others may use the ordinary wire fencing already in place, when it is on wooden posts. Some of these are continuously energized, while others are connected through interrupting devices which are supposed to give momentary shocks from an interrupted circuit. It is claimed that these auxiliary devices render the current harmless, particularly the interrupted circuit device, which is supposed to prevent the possibility of an animal or person becoming "frozen" to the fence. In all cases, of course, contact between the energized body and the ground completes the circuit, and the idea is that domestic animals will receive a mild electric shock that will make them afraid to touch the fence, so they will soon learn to avoid touching it and thus remain in the fields or enclosures where they are placed.

Devices of this kind may appear simple, practical and harmless to laymen who are not familiar with electrical devices or with the physiology of electric shock. Such a fence is probably inexpensive to build in comparison with good stout fences capable of holding the larger domestic animals, and the ordinary secondary circuit of 115 volts may be considered quite harmless by uninformed persons. In fact, a statement has been seen to the effect that such a construction is as safe as a telephone wire or any of the ordinary electric appliances. This statement is not true, as anyone who has studied the cases of low voltage electrical shock will understand. A circuit of 115 volts in a situation where contact is completed with the soil is potentially dangerous to human beings under all circumstances, and voltages considerably less than this are probably fatal to horses and cattle. It is obvious that a voltage sufficient to produce a sensible shock when the surface of the soil is reasonably dry will, under ordinary circumstances, be fully capable of producing a fatal shock when or where the soil is wet. Moreover, the interrupting devices which are supposed to be used with some of these applications do not necessarily provide immunity and cannot be depended upon for this purpose, since a substantial percentage of recorded fatal low voltage shocks have not been associated with the phenomenon of "freezing." There is the further consideration that even if these alleged protective or limiting devices were actually effective for their purpose they would be in the hands of laymen and otherwise would certainly deteriorate unless they were very elaborate, and therefore expensive, mechanisms.

A large proportion of the recorded fatal low voltage shocks to persons are received under conditions where the body of the victim is in direct contact with the soil. This is the case to such an extent that this situation has come to be one of the characteristic situations producing fatal electric shock. It is extremely improbable that devices of this kind, when derived from commercial electric light and power circuits, even under expert supervision, could be so regulated and controlled as to render them uniformly safe against fatal shock to persons or livestock and at the same time have them fulfill their intended purpose.

These objections to an electrically energized fence apply equally to the practice which is sometimes observed of energizing garbage cans to keep dogs and cats away from them. It is quite possible that persons making accidental contact with such energized cans might receive a disagreeable or even a fatal shock. Particularly in the case of children it is quite possible that they might be encouraged to experiment with mild shocks, always with the possibility of an ultimate fatal result, and it may well be that the attractive nuisance theory applies in such a situation. There is already in the record a case of one small child fatally shocked by contact with an electrically charged chicken coop. While low voltage shock is not as hazardous as high voltage, experience indicates that under certain defined conditions it is possible to sustain fatal shocks, and the record further indicates that persons rendered unconscious through contact with a low voltage circuit are seldom resuscitated.

In view of all of these conditions it appears that the practice of energizing fences or other property constitutes a definite and unnecessary hazard to persons, livestock and pets. It may be stated that the use of electricity for the definite purpose of producing electric shock is indefensible under all circumstances except in the case of electro-therapy administered by qualified experts or in the case of those who are aware of the hazards involved and are prepared to accept the consequences.

Seventh of a series of articles sponsored by the Accident Prevention Committee, Edison Electric Institute. W. A. Buchanan, Chairman.

Carl D. Jackson

CARL DEWITT JACKSON, widely known public utility lawyer and counsel for the former National Electric Light Association and national public utility associations, died suddenly in Rio de Janeiro on June 12. At the time of his death Mr. Jackson was special counsel for the Brazilian Traction Light and Power Co., Ltd., and had served in that capacity since Feb. 1, 1934, when he retired as counsel for the American Gas Association.

Born in Evanston, Ill., Sept. 13, 1870, Mr. Jackson was graduated from Harvard University in 1894 and took up the practice of law June 1, 1895, at Oshkosh, Wis. He was appointed a member of the Wisconsin Railroad Commission in 1915 and served as chairman of the Commission from 1917 to 1922. Because of his knowledge of public utility regulatory practices, Mr. Jackson was elected president of the National Association of Railroad and Utilities Commissioners in 1921, and served a one-year term. Early in 1923 he was retained as consulting counsel by the American Gas Association and National Electric Light Association and served in that capacity for several years, later becoming counsel for the Joint Committee of National Utility Associations in connection with the Federal Trade Commission investigation of the utility industry. Subsequently, Mr. Jackson served four years as counsel for the American Gas Association and resigned this assignment Feb. 1, 1934, to become special counsel for the Brazilian Traction Light and Power Co., Ltd., at Rio de Janeiro.

Surviving are his widow, three daughters, Mrs. John Q. Tilson, Jr., of New Haven, Conn.; Elizabeth Jane of the Netherwood School, New Brunswick, Canada; Carol, of New York; and one son, Andrew, of Wesleyan University at Middletown, Conn.

Funeral services were held at Rio de Janeiro on June 13 and interment was at Oshkosh, Wis.

The Effect of Service Standards on System Design

By N. E. Funk

Vice President in Charge of Engineering, Philadelphia Electric Company, Philadelphia, Pa.

An address before the Second Session of the Third Annual Convention of the Edison Electric Institute, Atlantic City, N. J., Monday afternoon, June 3, 1935

IT is possible to design a system of power supply so cheaply that the poor service rendered to customers would be unacceptable to them, no matter how low the cost of the service might be.

A system designed for economic supply of electric service must, of necessity, consider commercially acceptable standards of service characteristics. Standards materially higher than this will increase the cost of service and tend to reduce the use; conversely, materially lower standards, even at equivalently lower costs of service, would prevent use by many otherwise potential customers because of the unsatisfactory performance that would be experienced.

During the past few years, the electric utility industry has been criticized for many things by many people, most of whom have had no experience with and but little knowledge of the economic commercial requirements of this highly technical business.

Some of this criticism has taken the form of developing estimated costs purporting to show how cheaply facilities for power supply could be built by these proponents of public ownership who have never had the responsibility for building or operating them.

Usually, these low cost estimates are attained by the assumption of very primitive construction, the service from which would not be tolerated by the present-day customers. Provision for acceptable service automatically increases the quantity and cost of the facilities above the bare skeleton installation that might permit a minimum supply of service.

In addition to service requirements, regulations imposed by political bodies, national, state and local, necessitate provisions for extra facilities that are not inherently related to the supply of electric service, but which nevertheless increase its cost.

No prescriptions or magic formulæ can be laid down to apply universally to all electric service systems, but the major requirements of acceptable service can be defined; and such definitions are used in all well-regulated systems to guide and control design and operation, tempered, of course, by the many and varied local conditions that must be considered if the most economic service is to be supplied to the particular locality.

MR. FUNK

Service can be supplied over the inanimate facilities of the system only by the operating personnel; thus, the nature and quality of their contact with the consuming public is also a factor in supplying satisfactory service.

The Major Factors of Acceptable Service

1. *Continuity*

Interruptions must be infrequent and of short duration.

The cost of power is so small as compared to all other manufacturing costs in most industries that production derangements caused by frequent and long power interruptions would be much more expensive than the cost of the power itself.

The almost universal dependence upon electric lighting as the only source of illumination, the wide-spread ownership of radios and refrigerators, and the increasing use of electric ranges and water heaters have made a high degree of service continuity a necessity to the household. The saving of a few cents a month by the use of a primitive system would not compensate customers for cold breakfasts, or dinners, or baths, spoiled food, sitting in the dark, or missing favorite radio programs several times a month.

2. *Voltage Regulation, Flicker, etc.*

Service voltage must be kept within reasonable limits, otherwise energy consumption devices will give unsatisfactory results. The increased use of appliances in the home necessitates increasing care in distribution design because of the greater and more variable load in each location. These appliances also may be the source of objectionable flicker in voltage unless precautions are taken to prevent it.

3. *Safety*

The system must be designed to safeguard the customers, the general public and the employees operating the system. This requirement always raises the standards and costs of construction above the minimum that theoretically could be used to supply the ultimate consumer, on the basis that electrical energy might not be available many times when needed.

4. *Customer Contact*

Arrangements must be so organized that the customer can readily make pleasant and effective contacts with the company. This necessitates convenient, attractive and efficient offices where applicants may arrange for service, or changes in service, where bills may be quickly paid, appliances purchased, or special problems considered.

Telephone contact with the Service Department of the organization must be available at all hours of the day and

night so that service difficulties may be quickly corrected.

High service standards are indirectly of further advantage to all customers since additional use is encouraged, thus reducing unit costs and lowering service rates. Service continuity, voltage regulation and safety factors are all closely related in system design. Many designs to obtain safety automatically increase service continuity and vice versa. Likewise, designs to improve service continuity may improve voltage regulation. It is somewhat difficult to determine separately the effect of each of the three factors on system design, but it is comparatively easy to demonstrate the combined effect of all three in producing acceptable service.

The design of the component parts of the system occasioned by the supply of commercially acceptable service rather than an irreducible minimum service will now be discussed in some detail.

Effect on System Design

1. *Generating Stations*

Electric energy cannot be stored economically, but must be delivered on the instant of demand. This necessitates the installation of additional equipment over and above that necessary actually to supply the load demand so that there may be no diminution of service in the event of equipment failure. This additional equipment, hereafter referred to as spare equipment, is required irrespective of whether the prime movers operate on a thermal cycle or are actuated by falling water.

Inherently, the hydraulic turbine is more rugged than the steam turbine, but the electric generator in either case is basically the same, and subject to fundamentally the same disturbances and faults. There has been a tendency in the past few years on the part of enthusiastic supporters of hydro-electric development to assume that no spare capacity is required in hydro-electric generating stations. A system could be operated without spare generating equipment but only at the expense of service continuity.

As an example, the minimum percentage of spare capacity will vary from 100 per cent of the load in a small station with two units of equal size to 20 per cent of the load in a large station with six units of equal size. In the case of large inter-connected systems with many stations, the percentage of spare may be as low as 10 per cent to 15 per cent, depending, among other factors, upon the ratio of the size of the largest unit in the combined systems to the combined system load.

When the load is sufficiently large to permit the construction of several stations of reasonable size, it is desirable to provide for power supply from several generating stations rather than from one mammoth station. The investment in several stations and their operating cost would be somewhat greater than for one station. The somewhat higher cost is fundamentally an insurance premium paid for service protection against unusual accidents. While of infrequent occurrence, there have been occasions when complete generating stations have been accidentally shut down without serious effect on any part of the system because of a multiplicity of power generating sources. Moreover, the supply of a system from a number of generating stations rather than from one reduces the possible outage from transmission line interruptions.

The inclusion in the design of the generating station of safeguards to employees working there and the service to the customers necessitates a material increase over the equipment necessary to supply a mediocre service. Provisions must be made to isolate equipment failures quickly and without disturbance to other parts of the station. High voltage switches and buses must be isolated by separation or enclosure so that faults may not occur between adjacent live parts, and accidental contact can be reduced to a minimum.

Some of the station auxiliaries, such as boiler feed pumps and station service transformers, must be duplicated. Past experience in service supply has led to the almost universal adoption of bus arrangements in the generating station so that the serious failure of some portion of the bus section will not completely disable the station.

2. *Transmission*

Service could be supplied to the load over one transmission line from a single source of power, in which case whenever the transmission line was in difficulty, service would be interrupted until such time as the line could be put back into service—a very unacceptable condition to the customer. To safeguard against interruptions from this source, the transmission is designed either with structures supporting duplicate lines on one right-of-way, or by single lines along separate routes from the same generating station, or from different generating stations to safeguard against simultaneous outage during severe thunderstorms.

Major aerial transmission lines must be designed for severe wind and sleet loadings where these conditions exist. It often has been claimed that there is a great amount of information available on transmission costs, indicating that this cost is more or less standardized. Nothing could be farther from the truth. In locations where severe sleet and wind storms are frequent, it is necessary to use materially stronger construction than is required where these conditions do not exist. For this reason, transmission line costs for such territory is much more expensive than where these conditions are much less severe or absent entirely.

All too frequently, in discussing transmission costs, the cost of right-of-way is either neglected entirely or given but little consideration. Quite frequently right-of-way is the greatest *single* item of transmission cost.

In almost every section of the country lightning is a hazard to service and requires extensive protection, such as ground wires, counterpoise wires and lightning arresters. Of course, if a high degree of service continuity is to be discarded and frequent outage from lightning troubles to be accepted, then a material reduction in line protection costs could be countenanced.

In spite of all the progress already made toward improving the lightning protection on transmission lines, well over 80 per cent of all aerial transmission line outages are still due to storm troubles.

In case of underground transmission where it can be economically done, it is desirable to install cables along different duct routes so that a serious disturbance in one duct route will not completely interrupt transmission service. In systems where substations are so located that the minimum cost of transmission dictates the supply from a single generating station, it is in many cases desirable to have spare transmission between this substation and a substation supplied from some other generating source. This is particularly true in large urban centers.

Since the provision of underground transmission facilities materially reduces the likelihood of storm troubles and is one of the factors which influences their use for important transmission circuits in congested areas, it seems appropriate to recognize that the cost of underground facilities ranges from three to

five times the cost of equivalent aerial circuit capacity.

In heavily congested areas it is necessary to construct underground facilities rather than aerial, which require the building of interconnected duct and cable systems. In the design of the duct systems it is necessary to provide for more than the immediate requirements, since it is impractical and uneconomic to frequently open streets to install additional duct when new transmission facilities are required.

In many cases the City Ordinances compel the installation of ducts at the service company's expense for City service that have no direct relation to supply of electric service.

To summarize briefly, the facilities in the transmission system, depending, of course, upon local conditions, include 25 per cent to 100 per cent of spare equipment in addition to the minimum which would be required if our customers would tolerate the inconvenience of the service outages that would accompany the absence of spare capacity.

3. *Substations*

Substation equipment failures are second only to transmission line failures in the number of customers whose service might be interrupted if the design were inadequate. Although substation equipment is less affected by storms, years of operating experience have taught the normal electric service company that there are some factors which must not be overlooked.

To provide for virtually uninterrupted supply to the load in case of equipment failure requires from 33 per cent (4-bank substation) to 100 per cent (2-bank substation) more investment in transformers than the bare minimum required for supply of the load without regard to service continuity.

Although in some instances high tension bus-bars may be avoided without the possible reduction in substation cost being more than offset by the increased cost of transmission facilities which almost always accompanies such arrangements, it is a practical impossibility to avoid low tension buses in the substations. There are many variations in the design of these buses, ranging from the single bus in the very small substations to two independent buses and possibly sometimes also an auxiliary bus in very important substations and intermediate possibilities of variations in ring bus arrangements, but it would be my estimate that requirements of service continuity increase by 30 per cent to 100 per cent the substation bus and switching facilities needed.

Generally, the most effective location for the distribution voltage regulating equipment is in the substation. The provision of such equipment represents one of the important cost factors in substation design. In most cases this cost cannot be avoided without customer acceptance of inferior voltage regulation, or without facing comparable, and usually much greater costs for the additional transmission and distribution circuit capacity required in such cases to maintain acceptable voltage regulation.

Adequate protective relaying of distribution circuits is essential. The increasing service continuity requirements are each year requiring more extensive use of automatic reclosing equipments on distribution circuits to minimize service impairment, particularly from unattended substations. Most circuit trippings result from transient conditions so that service will be interrupted only momentarily, if the circuit is automatically re-energized. In this manner the inconvenience caused by interruptions may be appreciably reduced; since interruptions to lighting customers may be made short enough to be relatively unimportant and momentary loss of energy for household water heating and cooking appliances is inconsequential; while the shorter duration of commercial power load outages is not so likely to interfere with production.

Chief among the many factors which must be considered in the design of a substation, in order to insure good service, is the matter of safety. Although personnel safety is the primary consideration, the promotion of personnel safety is almost inseparably related to the safety of equipment and continuity of service. Safety involves provision of reliable fire-fighting and preventive equipment, lightning arresters, relaying systems, adequate isolation of equipment by means of barriers and screens, confinement of stored oil and oil-handling facilities, proper lighting levels and duplicate lighting sources in emergencies, safety-built equipment such as metal-clad switchgear and dead front switchboards, and in addition, a type of design that lends itself readily to maintenance and inspection of equipment. All of these are required to insure personnel safety as well as the nearest practicable approach to continuous, uninterrupted operation.

4. *Distribution*

I believe it is expedient to consider the distribution system in terms of its major components.

Poles

In the skeleton system, the height of poles would be limited only by minimum ground clearance requirements and pole strength would be no more than sufficient for moderate climatic conditions. Additional clearance is frequently required on account of trees, crossings over other pole lines, trolley wires, etc. Infrequent but severe winter storm conditions also must be reasonably provided for.

There is frequently the requirement that additional pole height be provided to support municipal fire alarm and police circuits, which may in many instances add more than 50 per cent to the pole loading. Standard heavy wind and ice loading conditions alone are approximately two and one-half times as severe as for light loading. These factors beyond the control of the electric company have a very marked effect on the cost of the distribution pole plant, which, alone, accounts for approximately one-third of the total investment in aerial distribution.

The necessity of tree trimming and in some cases increased pole height to give adequate clearance where trimming would be ineffective in reducing storm outages are factors which vary widely in different areas and are frequently overlooked. Pole costs in place increase approximately in proportion to the square pole height, and approximately in direct proportion to the mechanical loading to the conductors.

Poles of local cut or inferior timber, often unseasoned or untreated, will make a showing in low first cost, but are extravagant from a long-range point of view.

Pole fixtures must be provided to allow sufficient clearance between conductors and provide ample climbing space for the linemen. This generally requires a longer crossarm than would otherwise be provided.

Without giving proper recognition to the foregoing factors, which materially affect pole plant costs, it is extremely easy for the uninitiated to under-estimate seriously such costs.

Primary Circuits

The load carrying capacity of a primary circuit is determined by either of two major factors: voltage regulation

or the current-carrying capacity. Present day requirements of service continuity in general require extra circuit capacity to provide for the emergency supply of the load in case of circuit trouble. In well built-up sections this may require as much as 25 per cent minimum spare capacity in the substation circuit sections and feeders, to say nothing of external provisions for circuit breakdown extensions and adequate sectionalizing devices to permit prompt and efficient emergency load transfers. Since the number of circuit outages per circuit year under given conditions is quite definitely related to the miles of primary exposure per circuit, the electric service company frequently encounters the necessity for limiting the amount of such exposure and therefore the area which the circuit can supply, regardless of the load-carrying capacity. This limitation which must be recognized in order to give acceptable service continuity in most of the suburban and rural areas, often requires as much as 100 per cent more circuit capacity than would be required in a skeleton system where service interruptions or voltage regulation were not sufficiently considered as a factor in design.

The wire sizes used in the primary branches, which usually represent over 80 per cent of the primary circuit mileage, are almost entirely determined by mechanical loading, hence in many cases the sizes required for service continuity are considerably larger and more expensive than those sizes which would have adequate load-carrying capacity.

Secondary System

For the purposes of this discussion, the secondary system is taken to include the distribution transformers and secondary conductors up to the point of service take-offs. From the point of view of service continuity, the secondary conductors themselves are perhaps the least likely to cause customer interruptions, because of their low voltage, their individually limited exposure, shielding by the higher voltage wires, and the fact that the sizes required for economical load capacity are mechanically adequate. Transformers are susceptible to lightning surges and to overloads. Their protection against these causes of failure frequently involves substantial increase in cost, particularly on small transformer installations which predominate in areas of light load density.

Permissible voltage regulation as determined by customers' service requirements is a very important factor in the secondary system. This is because the capacity of the system is almost directly proportional to the permissible voltage regulation. While costs vary greatly, at different locations and in different areas it is probably conservative to say that the cost of the secondary system laid out for 5 per cent overall transformer and secondary voltage regulation will, in general, be approximately 20 per cent greater than if, for instance, 7½ per cent voltage regulation were permissible.

Voltage flickers due to residential motor-driven equipment are becoming increasingly frequent. Prevention of such voltage troubles may require installing more secondary system capacity, particularly transformer capacity, than otherwise would be required for the normal load.

Unless careful consideration is given to adequate service requirements in the design of the secondary system, the cost estimates may be found to have provided a system that results in unacceptable customers' voltage regulation.

Underground Secondaries and Networks

Service continuity becomes a very important factor in congested business areas not only because of the inconvenience but the possible hazard which may accompany a service outage because of the larger number of people confined in a small area. Under such conditions it has been found that the requirements can best be satisfied by the use of some type of low voltage network. Aside from the desirability of this type of construction it is practically made necessary because of the inability to install safely sufficient aerial facilities to supply the load requirements in the space that is available.

This method of meeting service requirements unhappily brings us face to face with the cold fact that underground construction requires from three to five times as much investment as equivalent aerial construction. Furthermore, the spare capacity requirements for low voltage network service are even more severe than for other methods of supply. Naturally, competent designers, who appreciate the cost penalties, will weigh carefully the need for the additional service continuity which can be attained by the use of underground and network construction, before deciding upon their use in any given instance.

5. *Safety—General*

Under the heading of "Safety to Personnel" may be grouped many such items as ample provision for emergency exits in exposed areas, remote operation of equipment, warning signs, effective blocking procedures, adequate clearances, adequate permanent grounding protection and effective portable grounding facilities to protect workmen in vicinity of blocked-out but normally alive facilities, interlocking where possible to prevent switching errors, a carefully supervised convenient supply of rubber gloves, safety insulating boots and blankets, etc.

The provision of safety equipment is futile if it is not properly used, hence one of the most important factors in safety is an extensive, alive and continuous program for instruction of the operating personnel in the thorough and effective use of such safety equipment. Alert supervision is important but not sufficient. Almost inexplainable, momentary lapses of safety consciousness are responsible for most accidents.

Most employees of the electric service company should be grounded in the principles of first aid.

None of this work can be done without cost.

6. *Service Buildings*

To reduce the time of service restoration to a minimum, service buildings are located at strategic points in the service territory.

This permits comparatively short travel distances to make repairs to equipment which has failed in service, a very necessary feature during severe storms which may strike many widely separated localities in the course of a few minutes.

The multiplication of service buildings and forces is an essential requirement of a high degree of service continuity.

7. *Customer Contact*

(a) *Load and Trouble Dispatching*

Perhaps one of the most important and specialized electric service functions comes under the heading of load and trouble dispatching. I shall not attempt to distinguish between load and trouble dispatching, but shall treat them briefly as one. Among their other many and varied responsibilities, these employees are chiefly concerned with doing everything humanly possible under constantly changing conditions to safeguard life and property, to reduce to a minimum the probability of service outages to attain every operating economy consistent with these requirements, and to expedite

the restoration of interrupted service.

Very few have an opportunity to realize the important part that load dispatching plays in the smooth, day-to-day operation of the system, but many are grateful for the services of the trouble organization which is always ready and eager to assist any customer at the very time when prompt, considerate and effective remedial measures are most needed.

Load and trouble dispatching includes exercising almost complete operating supervision of the entire system, in such a way that the customers' requirements are anticipated and service troubles are promptly corrected. Continuity of service must be preserved, the safety of the operator must be assured, the safety of the workmen must be guaranteed, and such economy of operation must be effected as can be attained with the above requirements.

The dispatcher's office is the nerve center of the system. He must be supplied with a board which is his memory chart. Generally, the information which it can show is so limited that it must be supplemented by complete, up-to-date supplementary diagrams, charts, maps, etc. Frequently, the office is equipped with graphic meters for each generating station which give a continuous automatic record of the load on each station and on the system, so that the system load may be distributed between generating stations from moment to moment in the most economical manner consistent with safety and reliability, and machines may be put in and taken out of service in such a way that there will be in operation neither too much equipment which would be uneconomical, nor too little equipment to carry the load in case of a failure.

The men assigned to this work must have dependable judgment under severe stress and an intimate working knowledge of all the factors which affect the operation of the system, as well as ability for attention to details and continuous recognition of individual responsibility in the discharge of the duties, if accuracy in performance is to be assured. Accuracy of performance is necessary not only to assure continuity of service, but is most essential to insure the safety of the workmen. The necessity for positive and complete isolation of equipment on which men are to work especially demands the exercise of extreme care.

Provisions must be made for all trouble calls to come promptly to the dispatchers who direct the activities of representatives of the service organization located at strategic points throughout the system. In times of severe trouble, virtually the entire company organization is at the disposal of these offices, which must be equipped to handle hundreds of calls an hour. Such an important service function requires an extensive system of direct telephone communication always available for the unrestricted use of the dispatchers and the many components of the service organization.

Storms are a menace to service continuity. For this reason the dispatchers' office must be continuously in touch with the dispatchers of other systems and with the weather bureau to obtain the information necessary to prepare for storms. The dispatchers should be well informed of an approaching storm's progress and its direction so that reserve machines and lines may be put into service and so that the office and field forces may be expanded into a strategically deployed army that is prepared well in advance for any action that may be necessary. The cost of the facilities required for this very necessary service are never considered in the costs of a skeleton system of power supply.

The personnel of Operating Department employees is as important as the facilities and therefore particular emphasis must be given to their selection and training. This is necessary in order that service interruptions due to operation errors may be reduced to an absolute minimum, and that restoration of service after equipment failures may be carried out in an intelligent, efficient and resourceful manner.

In order to accomplish these ends, new employees must be selected with respect to their psychological fitness for the work and then carefully trained in the details of the work. Training courses for the older employees are also essential so that they may keep abreast of changes and be prepared for advancement.

I need not tell you that the resourceful and skilled personnel so essential in many phases of this industry demands natural individual characteristics above average in addition to careful selection and training, and that securing and holding men of this type requires appropriately attractive remuneration.

(*b*) *Office Facilities*

The customer requires as a part of his service the ability conveniently to make contact by telephone or personally with those who can supply him with the information he desires, correct troubles he may have with equipment or service, or clarify supposed difficulties.

If the territory served is large, a central office alone will not meet this requirement, but additional offices must be established in various locations to reduce the traveling distance for the customers who wish to make a personal contact.

By far the greatest number of customers who necessitate the multiple office locations are those in the domestic and small commercial class. As a matter of fact, the large power and commercial customers are generally contacted from the central office.

These additional office locations add materially to the cost of service, even though they are not directly connected with the technical function of energy supply.

I feel that I have merely presented some of the high spots of the subject covered by the title of this paper. Each category could be further expanded, some even into an individual paper on that one subject alone. Undoubtedly, much could be added, because the subject covers such a range of activities.

If, therefore, I have been able to direct attention to a few of the essentials that are all too frequently neglected by our industry's critics, I will feel that at least I have been helpful.

Discussion of Mr. Funk's Paper

By H. R. Woodrow*

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GOOD voltage regulation is more than ever essential in the supply of electric service. Utilities are facing the problem of encouraging greater usage of their service to offset rate reductions and to make further reductions possible. Load-building campaigns cannot be successful unless the service to existing appliances is so satisfactory that the customer can expect equally good results with new appliances.

It is not enough to assume that absence of complaints is an indication of a satisfactory quality of service. Probably the majority of customers will not complain until voltage regulation is nearly intolerable, especially if they are not

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accustomed to good service. If the system design is adequate, most complaints will be found to have no justification and the remainder will disclose the exceptional cases that cannot always be anticipated. Complaint investigations serve the valuable purpose of enabling the engineers to determine the degree of regulation that will be generally acceptable to customers. With the aid of periodic tests, it is perfectly feasible to maintain the system up to the desired standard.

The load carrying capacity and, hence, the cost of a distribution system are primarily influenced by the degree of refinement of its inherent voltage regulation. Years of experience have been required to approach a proper balance between increased costs for improved voltage regulation and lower costs to induce greater use of service. We are still striving to reach that balance which will give maximum value and greatest satisfaction to the customer. The balance varies with individual customers and with different classes of customers. New developments of utilization equipment are continually changing the balance.

Customers do not like rigid rules which limit their selection and use of equipment. Nor are such rules in the best interests of the Company, since they are bound to discourage the use of its service. On the other hand, some regulations are necessary to enable the rendering of a satisfactory service at a reasonable cost.

Necessity for Voltage Regulation

High or low voltage adversely affects in some degree the operation of practically all utilization equipment.

(a) *Illumination*

The effect of high voltage upon the life of lamps is one of our principal sources of complaint. In Brooklyn, during the last year, there were 2½ times as many high-voltage as low-voltage complaints. The basis for high-voltage lamp complaints is largely psychological. When a number of lamps happen to fail over a short period of time, the customer jumps to the conclusion that his voltage is high. In such cases, we recommend attaching a dated tag to each new lamp installed and almost invariably the result proves that normal lamp life is being obtained.

We have had occasional complaints from large commercial customers when a particular shipment of lamps happened to be defective and failed to last the normal life. Unfortunately, the defective lamps are invariably used up before we are notified and it is difficult to convince the customer that the voltage was not high during that period. In one case, we relamped a dozen sockets and maintained a graphic voltmeter on the circuit for nearly two months, proving that the lamps actually averaged slightly more than the expected normal life.

During the winter of 1931-1932, an unprecedented number of lamp complaints were received throughout the Borough of Brooklyn. Several apartment-house superintendents kept records of the life of hall lamps operating twenty-four hours a day and proved the life to be from one-third to one-half normal. Many employees reported that lamps purchased during that period gave out very quickly. As there was no change in voltage during this time, the only possible conclusion was that the lamps were defective. The trouble was apparently encountered in perfecting the manufacture of coiled filament lamps and no further trouble of that sort has occurred in the last three years.

It is a well-established fact that minimum overall unit lighting cost is usually obtained by operating lamps above rated voltage, especially if replacement costs are low. For a given standard of illumination this enables the manufacturers to sell more lamps, but it decreases the sale of kilowatthours. Perhaps it is fortunate for us that it is difficult to convince customers of this, since they dislike frequent lamp renewals and are not interested in lamp efficiency. Many apartment-house superintendents or office-building electricians are well aware of this principle, but cannot put it into practice without being criticized for increased lamp bills.

Low-voltage complaints based upon loss in illumination are practically unheard of in spite of the fact that standards and cost of lighting are adversely affected thereby. Many years ago when we were behind in construction work, cases occurred where voltages below 100 volts existed without complaint. Since then, routine surveys and a considerable amount of annual voltage improvement work have eliminated all but a few slightly low voltages, so that practically all low-voltage complaints are the result of improper operation of motors or appliances. It must be kept in mind, however, that the maintenance of normal voltage is financially justified because it increases the Company's revenue and results in greater customer satisfaction.

(b) *Radio*

Radio receiving sets have done more toward the disclosure of low voltage than any other appliances. They are the principal appliances used during the evening when residential voltages are lowest. Many of these sets are cheaply built and critical in regard to voltage. Faulty reception will bring a complaint quicker than almost any other trouble of a non-emergency character. However, many low-voltage complaints are found to be due to the inadequacy of the set.

Radio sets also cause high-voltage complaints by reason of tubes burning out, but improvement in radio tubes has greatly reduced this type of complaint.

(c) *Heating Appliances*

We have had little trouble with industrial heating furnaces, ovens, etc., probably because such apparatus is usually equipped with automatic heat control. Domestic appliances used during the day are seldom causes of complaint, since the voltage is then at or near normal. We have practically no experience with the domestic electric range, but the heavier services installed for range load, together with general system reenforcement justified by the additional load, should improve the inherent regulation and assist in keeping the voltage within the desired limits. In general, the effect of voltage that is only moderately low is not to prevent successful operation of heating appliances but only to slow down the operation.

(d) *Motor Operation*

Motors, in general, have given very little trouble in regard to operating voltage. Most complaints have resulted from the change from 240 to 208-volt service and are largely psychological in character. The most frequent claim is loss in production due to lower speed, although tests show the speed change to be entirely negligible. Control apparatus is a more real cause of complaint, especially elevator brake coils. We have encountered several cases where 220-volt brake coils were satisfactory on 208 volts until a system contingency temporarily reduced the voltage and the motors overheated because the brakes could not release fully. Some cases have occurred where single-phase 220-volt motors were operated on 208 volts and failed to come up to speed sufficiently for the centrifugal switch to act.

Flicker Problems

It is one thing to hold the voltage delivered to customers' services within a reasonable range of variation from normal, but it is quite another thing to hold the voltage steady within that range. Gradual and nominal changes in the voltage value cannot be detected in lighting and do not otherwise adversely affect the operation of utilization equipment. Abrupt changes in voltage in amounts still within the normal range can be detected by the eye, but are not objectionable unless repeated frequently. Frequently repeated or periodic variations of sufficient magnitude to be observed are decidedly objectionable. The resulting fluctuation in lighting is commonly called flicker.

Flicker is judged by its effect upon illumination and many tests made by various groups have determined the average sensitivity to flicker. In general, observers who can detect a 1½-volt change under test conditions would not be annoyed by a much larger change when not expecting it. Our problem is not to eliminate flicker entirely, as the expense is not justified, but rather to reduce it to an unobjectionable value. Our experience is that infrequent dips up to six volts or frequent dips up to three volts do not cause complaint and this is the basis of our permissible starting currents and of our investigation and correction of flicker complaints.

The sensitivity of lamps to continuous flicker has been established over a considerable range of frequency. The most sensitive point occurs at 6 to 7 cycles per second when a pulsation in voltage of about ¼ per cent can be detected, although greater variations can be permitted before the flicker becomes objectionable.

Gradual changes in voltage, caused by gradual changes in load on the system throughout the day, can be compensated for by some form of voltage regulator located in the substation or on the primary feeder circuits. Abrupt changes in voltage can only be reduced by making the distribution system stiffer, which means more copper, larger transformers, closer spacing of transformers, etc. This costs money.

(a) *Motor Starting Currents*

One of the principal causes of flicker is the large inrush current drawn when starting motors. There are three general classes of flicker complaints with which we have to deal, with somewhat different remedies in each case: (1) Large motors causing flicker on the primary feeder; (2) Medium-sized motors causing flicker on the secondary circuit; (3) Small motors causing flicker within the building.

The greater proportion of complaints in the first group have resulted from the use of open delta transformer banks connected line to neutral on two primary phases. Changing to a line-to-line open delta connection on the primary or to a three-phase transformer bank greatly reduces the effect and has been sufficient in nearly all of these cases. The largest motors as a rule are infrequently started, which permits a greater disturbance without complaint, and the permissible starting currents can be calculated in advance for each case. No trouble has resulted from motors installed under these conditions. There was some trouble in one area supplied over long overhead feeders where several coal, sand, cement, etc., companies with large, frequently operated hoists caused considerable complaint. This was settled by allocating one feeder to serve all of these loads, but with no lighting load connected to the feeder.

Flicker caused by medium-sized motors on the secondary circuit used to be fairly common. Sometimes excessive starting flicker from hoists was due to a careless operator or to too rapid timing of the first few steps of automatic starters. Flicker caused by miscellaneous industrial motors had often been in existence so long that it was too late to insist on special starting equipment. Where the flicker was due to the combined regulation of transformer and mains, separate power mains have sometimes been installed, although we usually preferred to relocate transformers or rearrange the secondary circuits. If the regulation of the transformer alone was sufficient to cause flicker, it could be allocated to the customer or replaced by a larger size. Our main consideration in such cases has been to eliminate the flicker affecting neighboring customers, although the methods used might not help the customer causing the disturbance. The latter invariably preferred to put up with the flicker rather than go to the expense of installing special starting equipment. Most of the industrial areas are now served by network and this kind of flicker complaint has practically disappeared.

The small motor in domestic use has caused more flicker complaints than any other appliance. Such motors are operated on the lighting circuit and the flicker is usually due to the regulation of house wiring. In the case of refrigerators or oil burners, the user is usually the only complainant and since in the great majority of cases the flicker is negligible at the service switch there is nothing we can do. The starting currents of these motors are well within the limits set by our rules and do not ordinarily cause trouble at other customers' services. When flicker does exist at the service switch it is because of the inadequacy of the service and reinforcement is in order. The most annoying case is the motor of cheap manufacture drawing a high starting current, and used frequently enough on a work-bench, washing machine, etc., to bring complaint from the neighbors. The cost of reinforcing circuits for this unusual load is unreasonably out of proportion to the cost of the motor. We have corrected several cases of this type during the last year by installing balancing auto-transformers on overhead three-wire secondaries.

(b) *Welders*

Spot welders have given us trouble in several instances. The outstanding case was a large welder drawing in excess of 200 kva and causing such a disturbance that a separate transformer and service mains had to be allocated to this job. This welder was used only occasionally, producing a revenue insignificant when compared with the cost of the special installation to serve it, and its use was discontinued after a year or two. Arc welders and arc furnaces are possible sources of flicker due to the large currents drawn in striking the arc.

It is our practice to review the flicker possibility of every proposed furnace or welder installation and in several instances where the use of welders or furnaces above 50 kva would have required excessive reinforcement of the distribution system we have requested the use of motor-generator sets.

(c) *Miscellaneous Causes*

Loose connections in fuse or switch contacts, or in wiring, are the most common of all causes of flicker. Blown neutral fuses in old style 3-wire service entrance boxes are another frequent cause. One fairly common complaint is due to a slight flicker showing in one apartment when a neighbor's refrigerator starts. Upon investigation, we find that the complainant did not mind the flicker but thought the next door appliance was supplied through his meter.

(d) *Continuous Flicker*

Some trouble with continuous flicker has been experienced with large ice

plants where two cylinder compressors were operated with one cylinder disconnected. The only case of flicker occurring where compressors were properly operated was due to the combined effect of duplicate 300-hp machines which frequently happened to operate in mechanical synchronism. This condition was corrected by installing a device to synchronize the machines sufficiently out of mechanical synchronism as nearly to eliminate voltage pulsation. It is interesting to note that through the cooperation of the NEMA, manufacturers of air-conditioning apparatus are considering the use of multi-cylinder compressors designed to produce less pulsation at higher and less sensitive frequencies.

With medium sized motors driving line shafting, etc., cases of pulsating flicker have occurred from open rotor circuits, or unbalanced stator windings.

Our experience with this type of flicker on low-tension services is principally with refrigerators or oil burners. The apartment-house refrigerator is the worst problem, as the voltage drop occurs mainly in the building wiring and is often very large. In general, we have found that running flicker does not occur with these motors unless the starting flicker is already excessive.

Starting Current Rules

In common with the practice of other companies, we have starting current rules, designed to prevent excessive flicker from appearing on the system. These rules permit blocked rotor motor starting currents of 30 amperes at 120 volts on the overhead system, 60 amperes at 120 volts underground, 60 amperes single phase 208 or 240 volts, and 100 amperes plus 1 ampere per kw of maximum demand on 3-phase 208 or 240-volt service. These rules are as liberal as the system will permit and are not particularly restrictive. Upon request, we will make a special study of a pending installation and give the customer the benefit of any additional starting current the system will permit. However, rules are always a source of annoyance to customers and are almost impossible to enforce, particularly in the case of the residential customer. The latter feels free to use any appliances he chooses without consulting the utility and from a sound commercial point of view it is preferable to overlook excessive starting currents and reinforce circuits when necessary to prevent flicker. Starting current rules could well be discarded in the case of residential service and attention concentrated upon encouraging manufacturers to design for as low starting current as will not handicap cost or performance.

Maintaining Voltage Standards

Our standard of regulation permits a plus or minus tolerance of 4 volts at the service switch. It is probable that a wider range would be considered adequate for most purposes, but the relatively small increment costs of maintaining close standards in metropolitan areas justify the higher quality of service.

In order to maintain these voltage standards, a complete survey of transformer loads and secondary voltages is made at least every two years on the radial system. During the last few years, when there was little increase in load, it was sufficient to make only a partial survey in alternate years, confined to those circuits most likely to have low voltage. The survey is made between approximately 6 p. m. and 10 p. m., starting in the middle of October and ending in February. An additional survey in spring or summer is made during the day in industrial areas. Besides the surveys, routine pressure tests are made periodically to check the regulation of primary feeders. The feeders are normally regulated by setting line drop compensators just high enough to avoid exceeding the permissible upper voltage limit at any service switch.

Transformer load tests are made by indicating ammeters, and preliminary voltage tests are made by means of indicating voltmeters. We require at least one voltage reading at the transformer pole in overhead areas or at the nearest service in underground areas, and several readings are taken at service switches at the ends of secondary branches. Any readings that are high or low or within one volt of being high or low are investigated further by means of graphic voltmeters. Some high or low voltages can be corrected by rebalancing loads. All other high voltages require lowering regulation and sometimes low voltages can be improved by raising feeder regulation if it can be done without causing high voltage elsewhere. Where redesign of the circuit is necessary, a number of load and voltage readings are made at various points on the circuit to provide the engineer with all necessary information. It is customary to make the new design adequate for about three years' average load growth. From the results of these annual voltage surveys, we estimate that approximately 96 per cent of our customers on the radial system are served within the normal voltage range at all times.

Investigation of Complaints

Our experience of the last few years indicates that 44 per cent of complaints allege high voltage, 41 per cent flicker, and 15 per cent low voltage. Of the high-voltage complaints, only one case in 75 proves to be high, but nearly all are complaints of lamp burnouts or radio trouble. Nearly half of the flicker complaints are due to loose connections and only one case in five shows the voltage drop at the service switch to be sufficient to cause flicker. One-half of the investigations of low voltage show normal voltage, one-third low voltage, and one-sixth are the result of poor connections.

The first step in investigating a voltage or flicker complaint is to install graphic voltmeters, and the final step after the trouble is corrected is to verify that fact with another graphic chart. The procedure for correcting high or low voltage is the same whether discovered during the survey or by investigation of a complaint. In flicker cases the important thing is to find the cause and, if it is a motor or other appliance, to measure the starting current and voltage dip. If the value of the dip is checked by calculation, the engineer can confidently determine exactly how much reinforcement is necessary to correct the condition. However, if the voltage dip greatly exceeds the calculated value, the cause of the discrepancy must be found. Faulty wiring or poor contacts in wiring, fuses, and switches are occasional causes of such discrepancies.

Correcting Complaints

There is no general rule that can be followed in correcting complaints; each case must be studied on its own merits and the most suitable remedy adopted. Secondary redesign is used in the majority of cases to remedy faulty voltage or to eliminate flicker which appears at the service. However, a minority of flicker cases are due to special circumstances, such as the cases previously discussed.

There are many complaints which originate as voltage complaints but involve other grievances, such as high bills, lamp or radio trouble, etc. After our voltage is proved to be or corrected to normal, utilization complaints, if not already settled, are referred to the appropriate specialists in lighting, radio, etc., to assist the customer in obtaining satisfactory operation.

Cost of Improving Service

In underground network systems the capacity necessary for continuity of service and burning off faults inherently provides good regulation. Underground radial systems are usually confined to areas of high load density and good regulation can be provided with little or no additional cost. It is the practice to design underground or overhead primary circuits according to the capacity required, since regulation can be secured more cheaply by means of substation apparatus than by overbuilding the circuit. However, when it comes to overhead secondary distribution, especially in low load density areas, designs based upon capacity alone are almost certain to be inadequate in regard to regulation. In the overhead areas of Brooklyn, we estimate that the excess capacity installed to meet the standards of regulation result in at least 20 per cent increase in cost over the minimum installation that would be required to carry the load. If this is true in a thickly populated territory like Brooklyn, it is highly probable that the excess cost of providing good regulation might reach 100 per cent in rural areas. When capacity above the minimum requirement is installed for reasons of continuity, safety, regulation, or other considerations, it is difficult to allocate the excess cost among them. Probably continuity should come first, in which case regulation should be assessed only with extra costs after the desired degree of continuity is provided.

The standards of regulation and permissible flicker to be applied vary with the usage to which the service is to be put, the proportion of extra expense involved, and the quality of service to which people are accustomed. People living in congested areas have become used to a high quality of service and would not tolerate anything less. The cost of improving rural services is relatively so high that it is not practicable to provide more than the minimum standard of regulation that will permit reasonably satisfactory operation of appliances. Even this is likely to be so much better than the average rural customer is accustomed to as to be considered entirely satisfactory. The additional cost of still further improvement, if reflected in increased rates, would not meet with the customer's approval. However, if the minimum requirement for reasonably satisfactory operation of appliances is met, it encourages additional usage which will, in the long run, justify additional improvement in the quality of service.

By W. E. Mitchell

Vice-President and General Manager of the Georgia Power Company

MR. FUNK is due the sincere thanks of all members of the Institute for the splendid paper which he has just presented. He has succeeded in the wellnigh impossible task of outlining in a comparatively brief paper all the important factors which must be considered in designing a modern system for supplying service to a modern community which has been educated up to expecting from the public utility company first-class service in every way.

I would like to explain how we have met certain service requirements of large industrial power customers. No class of power consumers is in a better position to demand high quality electric service than this. Their loads are usually large enough to justify producing their own power requirements rather than tolerate frequent shutdowns, so they properly insist on a high degree of continuity of service if they purchase power from the electric utility. Just last week one of our customers complained because his plant was shut down 45 minutes while our trouble crew found and replaced a defective primary fuse on his transformer bank. This was one of two interruptions, other than of a momentary nature, this customer had experienced in five years. The other was for 39 minutes in 1933. His complaint was really a reminder not to get careless, and he was fair enough to admit that our service record had really been very good.

If we expect to hold important industrial loads, we must render good service. Even substation and transmission line designs of proven reliability are not always adequate. We have found, in many cases, that furnishing dual service has been of little help. Customers in this class had rather have one or two lengthy interruptions per year than a large number of momentary ones.

As far back as 1928 we began an intensive study of the causes of industrial customers' complaints. We soon discovered that their records showed about ten interruptions to our one. The majority of complaints then weren't based on actual line or station outages. These customers classed everything that interrupted their manufacturing processes as an interruption to electric service. We found 90 per cent of their complaints were based on voltage disturbances and not on actual service interruptions according to our definition of an outage.

The real trouble was in the customer's control apparatus. Practically all motors connected to our system were protected by instantaneous types of undervoltage devices, which would disconnect the motor for even slight voltage surges caused by flashovers, probably many miles away and on some other circuit. This was really a delicate situation. Our design and system planning were O. K., our protective relay schemes were selecting properly, we were having relatively few tripouts on the supply feeders, yet they classed our service as "rotten."

We realized it was necessary to sell our customers on the use of time delay undervoltage protection, unloading devices, etc., in order that their motors would ride over voltage surges of short duration. Numerous tests were conducted to prove to the customers that the idea was practical. Seven years ago, time delay undervoltage protective devices were available for only a few makes of contactors and compensators, therefore, we had the further job of getting the manufacturers to build satisfactory devices for all makes of motor starters.

It was a slow process, but we began getting results. Our customers gained confidence in our engineers and today, I am glad to say that between 200,000 and 300,000 H.P. of motors on our system are adequately protected with time delay undervoltage devices which permit them to ride over voltage surges of one or even two seconds' duration. This practice of assisting the customers in getting their own equipment in shape has worked wonders in improving our relations with our industrial customers.

In studying the effects of motor speed deceleration on the quality of material produced, we found that at least 98 per cent of industrial loads in Georgia could ride over three seconds of zero voltage without detrimental effects. These tests backed by the ingenuity of some of our engineers led to the greatest step toward service improvement during this era; i.e., rapid reclosing of feeder breakers.

The advocates of this practice argued that a half second of zero voltage was no more serious than a half to one second of surge voltage. It sounded reasonable, but how would the breaker stand up under this type of service?

Without much encouragement from the designing engineers, or breaker manufacturers, our operating engineers tested the feasibility of this practice, trying it out on a large customer who was securing bids on a turbo-generator because of the importance of continuity of service. The results of this pioneer work are now so well known that I only need say that the customer did not buy the turbo-generator, nor have we lost a single customer in Georgia, due to poor service, since adopting the policy of instantaneous reclosing of feeder breakers.

Through the coordinated application of time delay undervoltage protection to motor control equipment and instantaneous reclosing of feeder breakers, we have held and given many of our customers, served from long radial feeders, most satisfactory service, who otherwise would have demanded dual feeds or discontinued our service. Well designed lines and substations do not necessarily mean that you can render service up to present-day standards.

Somewhat aside from the subject, but highly pertinent to reliable electric service, is another new development on our system. This is a practical system of telemetering and automatic remote control. It is not only reliable, but very economical, and is capable of spanning almost any distance. This equipment will greatly aid in controlling the transmission system and distribution of load over tie lines, which indirectly will improve service to every class of customer.

By Paul M. Downing

Vice-president, Pacific Gas & Electric Company

MR. FUNK'S paper on the "Effect of Service Standards on System Design" outlines and summarizes in excellent form one of the new problems confronting some of the companies engaged in this industry. His statement regarding a system that may be built with low cost as a primary consideration and service as secondary arouses a sympathetic response from me, as it vividly recalls similar conditions with which I have been personally familiar for many years. Not later than ten years ago there were three separate utility companies supplying energy in a part of our territory and prior to that time there were at least four in competition.

It has been my fortune, good or bad, to witness the building and operation of these companies since their inception as competitors in a territory already adequately supplied. They began with a minimum of supply and distribution facilities, with but little reserve in any part of their system and with types of construction not meeting what I would consider a reliable standard. I have seen our consumers go over to the new company under the incentive of lower rates. The load on the new system built up. The service was inferior to that which the consumer had formerly received and some consumers came back to the older company. The newcomer was forced to add reserve facilities for improvement of service alone and the inevitable result was that in due time the investment in the new competitive system, on a comparable basis, was higher than that of the older company. In late years, we have had to contend with competition from private plants, some of which have been designed on a low cost basis and without necessary reserve.

I fully agree with Mr. Funk that some of the statements now being made showing how cheaply facilities for power supply can be built are emanating from persons who have had no wide experience in the development of the utility business, nor are they familiar with the details and fundamental necessities of this industry or with the industries to be served. The present day physical system of the utility industry has come into existence only after years of development combined with field and operating experience and the high order of service that is being rendered today has not just happened.

From my personal experience of many years as an operating engineer and utility executive, I know that utility systems as a whole have not made major additions such as generating stations, transmission line, substations, and distribution feeders without carefully considering each installation. Such additions have been made for the purpose of providing for load growth or improvements in service because operating experience showed them necessary. Facilities were not added merely to spend money.

Unfortunately, those without background and training are not aware of the problems—youth cannot be told—and neither can some of our consumers; they will not believe our statements regarding cheap installations. Some knowledge can only be obtained from bitter disappointments encountered in the field of experience and that, perhaps, explains why some of these consumers insisted on returning to the old company and why we supply standby service to some consumers who have installed their own plants.

The consuming public as a whole is but little interested in the detail of the many physical units used in supplying service. We of the industry, however, know that these intricate and involved physical systems, efficiently operated, are delivering a very fine service at low rates. We have taken such pride in this service that I fear we are inclined to regard minor interruptions more seriously than the majority of our consumers.

Without solicitation, many consumers will volunteer the statement, "My telechron clock is rarely off time; I can't remember when my lights were out. I do not understand how you do it? To effect such an accomplishment has meant an increase in plant investment over the bare necessities and a well trained operating personnal.

Mr. Funk correctly states there are many and varied local conditions that must be considered in supplying the most economic service to the consumer. What is an economic service? Who is to be the judge? In the long run, it will be the consumer.

Municipal authorities can and do order adequate existing pole line facilities removed from the streets; the cost of the necessary underground ducts and cables will be surprising to many engineers who have had no construction experience with a congested mass of obstructions that lie beneath our city streets. The costs of complying with rules and regulations of various regulatory bodies will open the eyes as well as the pocketbooks beyond belief. Anyone who does this will get a liberal education when endeavoring to comply with the rules and regulations of those bodies having jurisdiction of overhead pole lines and equipment, highway commissions which specify where lines must be relocated, and what must be done when the highways are improved. And perhaps worst of all there will be but little to show for the large expenditures.

Referring to the detail factors relating to acceptable service such as reserve in generating stations, some extra capacity in transmission lines for use in the event of failure and distribution systems capable of limited future growth, we might ask ourselves if excess facilities were installed in the past. We should

(*Continued on page* 286)

Plant Modernization

By Marion Penn

General Manager, Electric Department, Public Service Electric and Gas Company, Newark, N. J.

An address before the Second Session of the Third Annual Convention of the Edison Electric Institute, Atlantic City, N. J., June 3, 1935

STATEMENTS have recently appeared in the daily press purporting to show that the electric industry is faced with a serious shortage of capacity in the near future, and that a large amount of generating equipment, which is obsolete, is being continued uneconomically in service. The purpose of this paper is to point out that no such shortage exists, and that when the need for future capacity arises the less efficient peak load carrying capacity, can be converted by modernization into highly efficient base load capacity. Also that this so-called "obsolete" equipment is performing its present function of peak load carrying in an economical manner.

Power Shortage Non-existent

Let us look at actual figures as to loads and capacities based upon data furnished by utility systems throughout the Country and compiled by the Statistical Department of the Edison Electric Institute. The installed electric generating capacity in utility plants was in December, 1934, 33,242,000 kw. This generating capacity though 12.5 per cent greater than in 1929, the year having the highest peak load and greatest output, produced 5.7 per cent fewer kilowatt-hours of electricity in 1934. A comparison between the heaviest week of 1929 and that of 1934 shows that if the 1934 week's output had been carried with the same operating margin of capacity as in 1929 there would have been 4,800,000 kilowatts of installed capacity in excess of the load requirements. In other words, at the beginning of 1935 there was a surplus of available capacity awaiting future load growth of nearly 5,000,000 kilowatts.

This statement is conservative because it is based upon the assumption that load and operating conditions at present are similar to those obtaining in 1929, notwithstanding the numerous interconnections which have been completed since that time, thereby increasing the effective capacity by reducing the amount of reserve required and also by the capacity gain due to load diversity.

MR. PENN

As an example of the effect of interconnection on the load which can be carried by a system, Public Service Electric and Gas Company of New Jersey can carry a load practically equal to the full nameplate capacity of its generating equipment without any allowance for spare. This is possible because reserve requirements have been reduced by interconnection with other large companies to the point where they are almost completely offset by the load diversity capacity afforded by these interconnections. While this does not perhaps apply to the same extent throughout the country, it does have a material effect upon the capacity required. It should be borne in mind, however, that interconnections are subject to the law of diminishing returns and that beyond a certain point interconnection with other systems does not result in much additional economy or capacity savings. Furthermore, plants under construction by utilities are not included in these capacity figures, nor are the uneconomical hydro-electric projects now being undertaken by the Federal Government, in regions where capacity is not now and is not likely to be required for any predictable future need. Since many generating systems were not loaded to the limit of their capacity in 1929 and for the reasons enumerated above, it is reasonable to assume that the true capacity surplus as of December 1934 was in excess of 5,000,000 kilowatts.

Although it is true that there is at present an excess of generating capacity, this does not apply to the same extent to transmission and distribution facilities. It is the usual practice to start building local transmission and substation facilities one year in advance of the actual need and distribution work during the year required. This having been the case for the period in which the depression started, it appears reasonable to say that in most cases the transmission and substation plant is built one year ahead. If, however, as appears likely, the loads of the current year equal those of 1929 and 1930, distribution facilities will presently be in need of expansion.

Present Usefulness of So-called "Obsolete" Capacity

One statement which made the press releases on power shortage more startling was the alleged fact that at least 2,000,000 kilowatts of the steam plant capacity is "obsolete" and should be scrapped. Most of this equipment, however, is now serving as spare and peak load capacity and is required to be operated only a limited number of hours during the year. Hence its inherent inefficiency is of little consequence in its effect upon total costs.

As a general principle it may be stated that old generating equipment may be scrapped and replaced by new equipment only when the cost of system operation with the old equipment in service exceeds the sum of the fixed charges on the new equipment plus the cost of system operation with the new equipment in service, due consideration being given to salvage value. This general proposition is true from an engineering and economic standpoint. As most of the older equipment in use is entirely adequate for the peak service required of it and is performing this service more economically than would be possible

with new equipment, all costs considered, it is usually impossible to justify scrapping it on an economic basis. Furthermore, the possibility of superposing high pressure and high temperature equipment upon older equipment when additional system capacity is needed, makes the scrapping of the older equipment economically unjustifiable. Only relatively small sizes of generating equipment, with attendant high operating labor and maintenance costs, can normally be scrapped when no longer economical for peak load service. It is therefore evident that the capacity surplus is not materially decreased by this so-called "obsolete" equipment.

Future Capacity Requirements

Under present conditions it is impossible to predict future loads with any degree of certainty, but it is our belief that the rate of load growth for the next few years will not exceed that of the years immediately preceding 1929, when the annual increase of generating capacity was approximately 2,000,000 kilowatts. Under this condition, the present surplus of generating capacity will carry us to the 1938 peak. Of course, this applies to the Country as a whole. Undoubtedly there are individual systems where capacity will be required earlier, but such situations are well recognized by the companies concerned and will be taken care of in the normal, logical way that has always prevailed in the past.

Should, for some unforeseen reason, the rate of load growth exceed that of the pre-depression period could the industry meet the situation? It unquestionably could, as a large amount of incremental capacity or superposed capacity could be added to existing plants in from twelve to eighteen months and the manufacturers of steam turbines and boilers can produce more than 4,000,000 kilowatts of generating capacity per year. Also under such conditions, additions could be made to existing hydro stations if such were warranted.

If a national emergency such as war should occur, is the private electric industry in a position completely to do its part? Again the answer is yes. Even during the World War the shortage of power was not very serious, and was confined to a few limited industrial areas and not generally throughout the Country. Lack of or inadequate interconnection facilities between generating stations was largely responsible for this situation. Today not only are the individual plants of an area interconnected but the larger industrial areas are interconnected with adjacent areas. Industry, by working three shifts a day, could have available double the energy now being produced in this country with practically no plant additions and with no difficulty for the utilities. Most, if not all utility companies have made thorough studies and have determined the locations for additions to generating capacity when required. In addition to this, improvements in construction methods and manufacturing methods have considerably shortened the time needed to get new capacity in service. The installation of capacity would parallel the construction of new factories and be ready by the time it was required. An interesting side light on electric utility preparedness for war is the fact that the United States has slightly more installed capacity in her generating stations than the combined total of Great Britain, France and Germany.

How Capacity May be Added

It has been the history of electric power generation that progress has been continuously advancing toward a greater utilization of the heat contained in the fuel. This progress has been made in steps, first by experimentation and research, and finally by the installation and practical use of the newly developed equipment.

The use of efficient apparatus to condense the steam from turbine generators goes back twenty-five years. With the advent of such condensers it was no longer possible to increase materially the thermal efficiency of generating units by further lowering the final exhaust pressure. Progress, therefore, has been directed towards increasing internal efficiency and raising the initial pressure and temperature of the steam before admitting it to the turbine so that there would be a greater amount of heat transformed into electrical energy before reaching the condenser. The elevation of the steam temperature and pressure has been in progressive stages and practically every large power generating system exemplifies these stages of improvement. Briefly, they may be classed as the 200, 400, 600, and 1200 lb. pressure plants, the latter two of which are of the most recent development.

There are three principal means of adding capacity to existing systems, namely:

(a) By the construction of new generating stations.

(b) By extensions to existing generating stations.

(c) By superposing steam or mercury vapor equipment on existing turbine generating units.

A fourth method, that of increasing capacity of existing units or replacing them with larger units, is sometimes possible also.

Generally speaking, the building of an entirely new generating station is the most costly means of securing new capacity. Undoubtedly there are instances where there is no other alternative. As such is the exception rather than the rule for immediate requirements, this discussion will be confined to the adding of capacity by extensions and superposing.

Extensions to existing plants can usually be made at a cost per kilowatt of capacity which is less than that for a new plant. These extensions can be made either with the present steam conditions or at higher pressures and temperatures; the decision depending upon which is the most economical means of producing energy, all costs considered, or other practical reasons.

In considering the addition of capacity at the older plants, particularly those in the 200 lb. class, superposing is a practical and economical means of securing new capacity and also makes possible the efficient utilization of the low pressure equipment. Essentially a superposed installation consists of a boiler or boilers generating steam at high pressure and high temperature, and a high pressure turbine generator which uses this steam and exhausts it into the older low pressure equipment. This has been a gradual development and there have been a number of installations made and others are projected to be carried out when load conditions justify. Superposition has been and is now receiving the active study of the electric light and power industry.

Superposed installations using high pressure and high temperature steam, or mercury units, will usually cost per kilowatt of increased system capacity not more than, and probably less than, the cost of an entirely new generating station with units of comparable size. The proportion of high pressure capacity which may be superposed upon low pressure capacity ranges from 60 to 100 per cent, depending upon the high pressure employed and the pressure at which the older plant operates. The amount of capacity which is superposed will depend upon the amount of low pressure capacity which it is economical to modernize as compared to

other methods of increasing capacity, and will vary widely for different systems. The older plants where superposition can be made are located at established load centers, and existing transmission and distribution facilities can be utilized partially at least in connection with the new capacity. The saving in system capital expenditures thus effected becomes a credit to the superposition plan.

The reason older generating equipment is less efficient than the more modern equipment obtainable now is due to several factors:

(a) The steam pressures and temperatures utilized are lower than those used in modern practice.

(b) The boiler equipment of the older plants does not utilize the fuel as efficiently.

(c) The steam cycle is less efficient, the modern turbine installation having steam bled from several points which is used to heat the feedwater.

(d) The turbines are inherently somewhat lower in engine efficiency than modern turbines designed and built according to present day knowledge.

(e) The condensing equipment is of somewhat poorer design.

In superposing high pressure and high temperature steam units, or mercury units, on the existing older plants the first two factors causing lower efficiency are largely overcome. The high pressure and high temperature steam used in such installations is generated in new boilers having large capacity and improved efficiency resulting from the more efficient fuel combustion and the greater heat absorbed from the furnace gases before being exhausted into the air. The superposed turbine generator unit takes the steam generated at high efficiency, and utilizes part of the heat which it carries at an efficiency equal to that of the corresponding high pressure end of a new condensing machine.

Steam boilers for operation at 1400 lb. pressure and 1000 F. are available without any change in basic principles of conventional design with natural circulation. Boilers of capacity for 1,200,000 lb. per hour steam flow are in operation and boilers for a flow of 2,000,000 lb. per hour have been projected. They are suitable for use either for superposed capacity or for completely new condensing plants.

High pressure exhaust turbine generating units running at 3600 rpm are available in sizes ranging up to 50,000 kilowatts, the size selected depending upon the capacity of the low pressure generating units which it is desirable to operate in combination with it. Lower speed machines are available in still larger sizes. The availability of the superposed unit is high because it has practically no auxiliaries. It is also relatively small and low in mass, and the temperature differential between the inlet and the outlet ends is not great compared to a condensing unit operating with the same initial temperature. The combination of high and low pressure capacity is high in availability also for the reason that if more than one low pressure unit is connected to it, the low pressure units may be alternately taken out of service for maintenance without interrupting the service of the high pressure unit.

The other causes of lower efficiency, those resulting from the less efficient cycle and poorer inherent turbine and condenser design, can usually be corrected at a cost of a few dollars per kilowatt. The resultant modified unit will have an efficiency usually not more than 3 per cent lower than a similar machine built today. If we assume that the superposed capacity is equivalent to 75 per cent of the low pressure capacity the combination of capacity will be only 1¾ per cent less efficient than an entirely new unit of comparable size. It is evident, therefore, that superposing is a most attractive means of modernizing existing generating equipment.

Usually it is not economical to attempt to modernize existing low pressure boiler units for efficiency gain alone. Where it is necessary to operate a low pressure boiler plant and where the installation of high pressure equipment cannot be justified it may be possible that a study will indicate improvements which can be made. Examples of this are the conversion to pulverized coal or oil firing from other types of firing and the addition of water walls with consequent increase in steaming capacity. It is not possible within the time available to cover all suggestions for improvement of existing plant.

Plant modernization has occupied the minds of operating company engineers and management throughout the life of the industry and the technique of modern utility practice has been developed by utility engineers in cooperation with manufacturers. The various technical committees of the Edison Electric Institute, such as the Prime Movers Committee and the Electrical Equipment Committee, and committees of other similar organizations form a common meeting ground for engineers and managers of the industry, for the interchange of ideas.

In considering this whole subject of plant modernization, one important consideration must be kept in mind; namely, that each system is a separate and particular problem which cannot be solved by any general formula. The engineers of each company or group of companies who have been dealing with their individual problems are usually the ones best qualified to determine the next steps to be taken on their systems.

Though this paper has dealt primarily with generating stations it should be pointed out that the transmission and distribution systems are constantly being modernized, and today represent the best known practice in the art.

Modernization of Public Service System

A brief resume of the improvements made in the generating stations of Public Service Electric and Gas Company within the past few years and what is contemplated for the future will serve to illustrate some of the means of modernization. Other companies are making improvements along the same or different lines.

At Burlington a superposed unit consisting of a high pressure boiler and an 18,000 kilowatt turbine generator, operating in conjunction with three older 200 lb. pressure units, has been installed. It has made available to the system 56,000 kilowatts of highly efficient capacity and is in line with future extensions providing for the installation of four 100,000 kilowatt condensing units. The older boiler plant is held in reserve for the operation of the low pressure turbines when the high pressure boiler is out of service.

At Essex eight boilers have been equipped for fuel oil firing and for the past two years have carried practically the entire load required of the station. Studies have been made for the installation, when needed, of two 50,000 kilowatt high pressure superposed units which will operate in conjunction with an equal amount of the existing low pressure generating capacity. The heat rate of the combination will be about 11,300 Btu per kilowatthour. Space for the new boilers and turbine generator units will be provided by the removal of eight of the present stoker fired boilers. It is interesting to note that 14 studies have been made on this installation before reaching the present

plan for modernization, emphasizing the fact that system development is a continuous process, requiring an intimate knowledge of system conditions. No outside agency would be qualified or competent to carry on such a study of system development.

At Kearny there has been installed a 90,000 kilowatt turbine generator operating at the normal steam conditions of the plant. The steam required by this unit has been provided by the addition of partial water walls and new superheaters to the original 12 boilers. Three large boilers have been equipped and operated with oil firing. A mercury vapor turbine generating unit of 20,000 kilowatt capacity has been installed and from a mechanical standpoint has been operating satisfactorily. The only difficulty now being experienced with this installation is of a chemical nature. Oxides are being formed within the mercury boiler which have been troublesome in that these oxides plug up the tubes and other spaces within the circulating system, causing tube failures. This is, however, being given constant study by the manufacturer, both in the field and in the research laboratory, and from all indications within a short time this difficulty will be overcome. The installation, which has operated at a capacity factor of 30 to 40 per cent since it went in service, gives results when in operation fully up to design expectation. The equipment is simple to operate and once the chemical difficulties are overcome the superposing of the mercury cycle will, without doubt, be used in many instances to obtain high efficiency and at the same time adding capacity to a system. It is probable that another mercury turbine and steam turbine will be added to Kearny without the necessity of additional steam boilers when more capacity is needed at that station.

At Marion, started in 1905, it is planned to install in the future a superposed boiler and turbine generator unit of 50,000 kilowatt capacity to operate in conjunction with three low pressure horizontal units. Twenty of the old boilers at this station have been equipped and are operated with fuel oil, and these will be used for peak load operation of the vertical turbine generators in the station. These thirty year old boilers have been operating on oil for three years at efficiencies above 80 per cent.

The Perth Amboy plant, consisting of two 5000 kilowatt turbines installed in 1911, and one 10,000 kilowatt turbine installed in 1918, is used only on peak about two months during the year when load conditions require it. It has not been found possible to discontinue its use, however, as its replacement would cost more in fixed and operating charges than its present operating cost. Due allowance has of course been made for the economical energy which the replacement equipment would carry. We are now making studies of superposing 1800 to 3000 lb. pressure steam upon this old equipment, and have found that 25,000 kilowatts of new turbine capacity at 3000 lb. with a Benson type boiler would carry the entire old plant with a resulting heat rate of 12,300 Btu per kilowatthour.

Exact costs have not been determined, but it appears now that it would cost not more than the average cost for a new condensing plant if credit is given only for the new capacity added. If the plant had reached the end of its economical usefulness as a peak carrier, and on that basis was being considered for scrapping, then in computing the cost per kilowatt from the capital expenditure involved, the capacity or divisor should be taken as the sum of the high and low pressure capacities, thus resulting in low unit cost for a highly economical plant.

The Public Service generating system today has a total capacity of 685,000 kilowatts. By virtue of load and reserve diversity resulting from interconnections it is possible to carry a firm load of 675,000 kilowatts on the generating equipment. The peak load of 1934 was 495,000 kilowatts, leaving a surplus of capacity 180,000 kilowatts for load growth. A study of future possibilities shows that 200,000 kilowatts of superposed capacity and 500,000 kilowatts of incremental capacity can be added to the system before new stations need be built. These additions, amounting to 700,000 kilowatts or double the existing capacity, can be made at a cost per kilowatt of 80 to 90 per cent of that for a new plant, and they would entail little additional cost for transmission.

Conclusions

In conclusion we may summarize as follows:

1. There is no general shortage of capacity in the United States today nor is there an impending shortage which cannot be taken care of by the companies involved.
2. The difference between total peak loads and total capacities does not reflect the true capacity situation, for interconnections, with resultant load diversity and reserve diversity have actually reduced the installed capacity necessary to take care of individual system peak loads.
3. Existing capacity is now being utilized to best advantage, the older and less economical plants having a logical place on the load curve as peak load carriers. Only in rare instances can any of this older capacity be economically scrapped, or can changes to it usually be justified unless accompanied by an increase in capacity.
4. The surplus existing in present installed generating capacity probably is sufficient to carry the Country to the 1938 peak. Although this is true for the Nation as a whole, there perhaps are some systems which will need capacity sooner. These systems will undoubtedly take care of their own situations as they arise.
5. When the system loads reach the point where new capacity is needed, the industry will be in a better position than before the depression to make additions to existing plant in a short period of time. This is because both utility engineers and manufacturers have given continuous study to better plant performance during this depression period, and the resultant improvements permit of economical plant additions along lines of recent development, and usually at incremental costs substantially below average costs. Improvements in the art have in reality made possible the continued economical use of the older equipment for many years to come, rather than making them obsolete.
6. In any emergency such as a war the private electric industry is in a position satisfactorily to meet almost any conceivable contingency.
7. The modernization of the 2,000,000 kilowatts of the so-called "obsolete" capacity by superposition upon it of steam or mercury generating equipment will make the older units an integral part of 4,000,000 kilowatts of capacity, comparable in efficiency to new equipment.
8. Finally electric utility operating and engineering management is fully alive to its responsibility to its owners, its users, the general public, and to the government in times of national emergency. The heritage which has been received from the founders of the industry, the brilliant example set by its leaders throughout its history have encouraged and inspired all whose privilege it is to call themselves part of the electric utility industry. The job done by these men in the past and being done at the present time should lend confidence to the Nation, and technical and managerial plans for the future may well be entrusted to those who know the business, and have never yet failed in their task.

Discussion of Mr. Penn's Paper

By A. H. Kehoe

Vice-president, The New York Edison Company

CAPTAIN PENN'S address forms a valuable treatise for engineering managers of the industry, and it certainly will be studied when plant capacity requirements are reviewed. His conclusions in summary form submitted should be broadcast both within and outside the utility field. They cover a part of our business which seems to be very confusing to the public, although quite simple as summarized in his address.

The fact that there is no shortage in generating capacity, nor is there likely to be one, may be disappointing to some persons, but I expect that in a short time that group of people will be telling the public that our sin is excess rather than shortage.

In considering some of the details which bring about misunderstandings, I think that particular attention should be drawn to Captain Penn's statement concerning the older and less efficient stations. If these stations act as the necessary spare capacity for a system, the almost certainty of their availability is extremely more important than is their efficiency for the few hours only when in an emergency they are possibly called on to supply the load requirements.

This matter of load duration on the non-base load generating units of the system is, according to my experience, almost totally misunderstood by those groups who pose as able to criticize our industry. The merchant in his business, and in fact, the operators of most every business, expect some reasonable delays to occur during the peak of their rush period. This must not take place in our business. We must meet our peaks with ample capacity, and no one has yet devised a way to hold up on the demand with the generation of electricity in a manner which will meet public acceptance.

The 1934 duration curve of a large metropolitan territory, with an output in excess of eight billion kilowatt hours, indicates that the loads exceeding 60 per cent of the peak value occur less than 500 hours during the year, or an average of less than two hours per day. On this same system the load was greater than one-half of the peak only about one-half the time.

If the significance of these facts were better understood, there would be less difficulty in realizing that reliable capacity is required for spares rather than highly efficient capacity.

I would also like to comment upon the problem of additional capacity requirements for the next few years. Let me first say that I agree with Captain Penn as to the proper means and methods of providing the capacity when it is required. Our problem is one of building up loads. From early in the morning emphasis has been placed upon load building, and finally, at the close of a hard day, the engineers come forth with the opinion that large increases in loads are not to be expected until after 1938.

Those who have noted the 1935 kilowatt hour output curve for the past few months twisting about the 1929 and 1930 curves, must realize that our overall increases, bringing the totals to their former values, are now taking place. They will also recall that it was not many years prior to 1929 that the percentage rate of increase per year was about the same as the percentage increase in existing plant capacities and it is now in excess of the 1929 capacity.

The engineering and operating branch of this industry come here saying that they can at relatively low cost add capacity as required, but that in their judgment the rate of increase will be in the next few years only about one-half to one-third of that which the industry previously experienced at its peak. The adequacy of existing capacity and our ability to quickly add to it as required seems to be assured.

In closing, may I call attention to the fact that in many cases there are further large savings to be made in addition to those mentioned in the paper, although Mr. Bailey touched on it in revamping rather than in scrapping an existing station. These savings are in that part of the transmission and distribution system which is supplied from the existing stations. Most of the feeders can be partially salvaged in all cases, and in many cases the entire previous investment is not only maintained, but serves to transmit additional capacity without additional investment.

Even if estimates of new generating capacity in a new location might be shown to give lower costs than a revamp of an existing station, yet, due to transmission and distribution expense, the revamp will prove to be the economical one to adopt.

By A. D. Bailey

Superintendent of Generating Stations of the Commonwealth Edison Company, Chicago, Ill.

SOME of the points in the paper presented by Mr. Penn deserve special emphasis. Each case must be considered on its own merits, as the decision will generally be based on special conditions of load, equipment, and the system served. There are several fundamental principles, however, which are applicable to all cases.

Old equipment is generally the most economical for peak service for a variety of reasons. The load factor is exceedingly poor and the running hours per year relatively few. The value of this equipment lies largely in its ability to be brought into service quickly either for peak or emergency service. Because of the small amount of output, the fuel and operating costs per kwhr may be large, but this is of little importance because of the relatively small output; and this cost is invariably only a fraction of the fixed charges which would result from the addition of new equipment sufficient to take care of this short, hour peak load. The old generating equipment which theoretically may have outlived its usefulness is, therefore, economically justified, though it may be called upon only for a limited time and for small amounts of output each year.

In considering the modernization of low pressure plants, the installation of superimposed equipment will be largely determined by the need for additional capacity, and it is quite generally agreed that for relatively large installations the cost of the new high-pressure, steam-generating equipment and the high-pressure turbine, with the improvement of the feed water cycle on the existing equipment and the necessary building changes will cost about the same per unit of capacity as would be the case with a complete new unit of steam-generating equipment, turbine, condensers, electric equipment, etc. In small installations the unit cost of

superimposed equipment may be higher, but it still may be justified because it improves the efficiency of an equal or greater amount of existing equipment which has already served its theoretical period of usefulness. In spite of its age, the old equipment is restored to its original usefulness and value. In cases where water for condensing purposes is limited, the additional capacity may be obtained without any increase in this requirement.

Most of the older equipment now installed is located near the load or near the center of some distribution system; switching equipment and the distribution system are already installed, and through these may be theoretically near the end of their useful life, their usefulness may likewise be extended by the improvement of generating equipment at existing locations and by increasing the generated output at these points.

Frequently the property area at existing locations is limited and additional land too expensive to obtain. The superposition of high-temperature equipment in old stations at such locations, therefore, adds to the use of the available property and increases its capacity for earning.

One of the principal reasons that superposition of high-pressure equipment is so successful is that most of the so-called low-pressure turbines are so well designed that for the steam pressure and temperature range for which they were built very little improvement could be made in a new machine designed and built at the present time. With the addition of steam bleeding and feed-water heating equipment, which can generally be effected at a reasonable cost, the efficiency of this equipment is nearly equal to that of the low pressure section of a modern steam turbine. The improvement in steam-generating equipment, that is, boilers, during the past fifteen or twenty years has been very marked, and in addition to the increase in steam pressure and steam temperature which has been made possible by the development of suitable metals, the improvements in design of boilers and firing equipment have resulted in not only a very marked increase in efficiency, but also in the reliability in operation. While we have been arguing for the past few years regarding the continued improvement in reliability of turbines and generators and their auxiliaries (their availability factor has passed 90 per cent), improvements in boilers have increased their availability factor to a similar figure. As a result, the large boiler unit has taken its place in station design, and installation and operating expenses have been correspondingly reduced.

The high ratio of invested capital to annual income is one of the peculiarities of our industry and the fixed charge resulting from this investment is one of the major items of operating expense. The depreciation item alone in the fixed charge is a most important item and one which must be accurately determined and applied in order to be fair to both the holders of securities and the public. Such depreciation is determined not by physical deterioration but by improvement in equipment, the general development of the industry, and even by peculiar conditions applying to a particular property or type of equipment. The physical life of any property or any part of it is not a measure of its obsolescence and cannot be used in determining the obsolescence rate. Since the investment item and the resultant depreciation charges are so important it is manifestly advantageous to prolong the useful life of any item of property as long as possible. The rate of depreciation for station equipment is probably as high as that for any other item, if not higher, and the restoration of this equipment which is already approaching the end of its useful life is a matter of considerable financial importance.

The last few years have impressed on the present generation the need for economy, both in capital charges and operating expense. There are literally hundreds of thousands of kw of generating capacity which has already served a useful life which may be economically restored to its original usefulness by the superposition of higher pressure, higher temperature steam-generating equipment. The ratio of the superimposed to the existing equipment will depend on the steam pressures and temperature ranges available, but as the metallurgists make it possible for us to go to higher steam temperatures, higher steam pressures will inevitably follow, which will make the proposition of superimposing high pressure equipment on existing stations even more attractive than at present and will make present sites and facilities more useful and valuable.

By Frank S. Clark

Consulting Engineer, Stone & Webster Engineering Corporation, Boston, Mass.

MR. PENN is to be congratulated upon the selection of a most timely topic and upon his presentation of it. With electric power consumption approaching the maximum rates of 1929-1930 the time is coming when system capacities must be increased, and were it not for the present turmoil and uncertainty, that time would now be upon us.

Mr. Penn has given you four means of adding capacity to a system. He is correct in saying that a new station is the most costly means of providing new capacity. Beside the plant itself, a new location means establishing a new distribution or transmission point with attendant costs of lines or cables, and switching equipment.

Mr. Penn has mentioned increasing the capacities of existing units. I believe that in a number of cases this will prove more than a possibility. Older equipment for heat generating and absorbing as well as for heat utilization is underrated in the light of present practice and it may well prove the case that by relatively minor changes in main or auxiliary equipment worth while additional capacity and also increased efficiency may be obtained. The work done along this line in Cincinnati and St. Louis are shining examples of its possibilities.

In considering the question of providing additional capacity in existing stations with the adoption of higher steam pressures and temperatures, I have one suggestion to make and that is that superposition of non-condensing capacity on present condensing generating equipment be viewed in comparison with a condensing installation made at the higher pressures as an extension to the present station. Old condensing turbine equipment may not be suitable for use with the regenerative cycle and may be as much as a pound of steam per kilowatt hour less efficient than that portion of a modern unit which uses the same pressure range. Also in utilizing present boiler room building space and facilities it is necessary to remove steam generating equipment which may be perfectly suitable for peak load service. Mr. Penn has stated that twenty of the thirty-year-old boilers in Marion Station are to be used for this purpose and that they are operating at efficiencies of over 80 per cent, which is excellent even when compared with modern equipment. I believe that in some cases the unit cost of such an installation will prove no

greater than straight superposition, especially when boiler equipment that is "used and useful" must be removed to make room for new boilers.

I agree with Mr. Penn that the ability to use higher and higher pressures and temperatures affords an excellent opportunity to improve efficiencies of existing old plants and at the same time provide additional generating capacities. Engineers have had ample opportunity to study various ways of accomplishing this as applied to their own peculiar situations and I am confident that when the public utility industry is again on an even keel in a smooth sea, we shall see a large number of such installations being made.

By John M. Drabelle,

Mechanical and Electrical Engineer, Iowa Electric Light and Power Company

I SERIOUSLY commend to you the very careful reading and study of Mr. Penn's paper entitled "Plant Modernization." In order to carefully consider this paper, it would seem desirable that you read thoroughly and carefully the recent report issued by the Federal Power Commission.

It is very true that over the past fifteen years that considerable progress has been made in the design of power stations, boilers, turbines, condensing equipment, and the steam cycle all of which, has resulted in higher thermo-dynamic efficiency in the generation of electric power by fuels. In the same period of time it is true that some progress has been made on the part of the designer of hydro electric equipment, but the advance in the art of hydro, I believe has not been so pronounced as the gain in efficiencies of the steam station.

There are certain elements in every power station which resists inadequacy and obsolescence, these are basically, the real estate, the side track facilities, the condenser water supply, and in a great many cases the building, the coal handling equipment, and the electrical gear.

The elements of a power station that do not resist obsolescence to the same degree as the above are the boilers, the fuel burning equipment, the turbines, the condensers, and the overall heat cycle of the power station. There are only a few power stations, that cannot be changed to produce a lower heat rate and more kilowatts of capacity per square foot of building area. This gain can be brought about in several ways: For example (*a*) by superimposing a high pressure, high temperature unit above the old equipment of the station. This obviously necessitates a change in boiler equipment which at the same time may mean a change in the type of fuel burning equipment in use or (*b*) a change may be made by installing new boiler equipment and new turbine equipment of the straight through type with, of course, extraction for feed water heating or by (*c*) replacing of the steam end of inefficient and lower pressure turbine generator units with a new and more modern type of turbine using higher pressures, higher temperatures and regenerative feed water heating. Any of these changes will give a material gain in power station capacity and at the same time bring about a very substantial drop in heat rate in the output of the station.

The Iowa Electric Light and Power Company is adding at this time generating capacity, incidentally these plans matured, long before the report of the Federal Power Commission. We are doing this in existing power stations by the use of higher pressures and higher temperatures with a more adequate regenerative cycle and are obtaining thereby more kilowatts of capacity per square foot of building area and a materially lower heat rate.

Each power station, as Mr. Penn states, must be considered as an individual problem, and that problem must be worked out upon its own individual merits.

Prize Awards Committee Report

(*Continued from page* 246)

their friends, with suitable recognition to those honored for their meritorious acts. I wish to take this opportunity to announce the names of these gentlemen who have distinguished themselves by the saving of life, in most instances that of fellow employees, and who have received medals during the past year.

NAME	COMPANY AFFILIATION
Arthur Faires	Pennsylvania Power & Light Company
Lafayette G. Nelson	Elk River Power & Light Company
John J. Christopher	New England Power Engr. & Serv. Corp.
Chas. Malaguti who assisted Mr. Christopher was awarded a certificate of assistance	
Mortimer G. Williams	Marlborough Electric Company
Nahen Jabbour	Fall River Electric Light Company
The Line Gang (Comprising Caleb B. Bartling, J. W. Quick, A. L. Brown, Duncan Davis and Thomas Hailey)	Tide Water Power Company
Gerald Roberts	Green Mountain Power Corporation
H. W. Slagle	Pennsylvania Power Company
Thomas Clyde who assisted Mr. Slagle was awarded a certificate of assistance	
Harry A. Glover	Duquesne Light Company
Edward O'Mara	Philadelphia Electric Company
Howard S. Leech	Virginia Public Service Company
Leslie G. Shelton	Texas Electric Service Company

The Committee of Judges for the Institute Medal, namely, Messrs. E. W. Gorry, Wills Maclachlan, C. R. Beardsley and Miss M. B. Woods, are now considering eight other applications for the Award. Thus, since the inception of the Award 25 citations of meritorious acts involving the saving of life from electric shock by the prone pressure method of resuscitation have been brought to the attention of the Committee.

Finally, the Committee desires to express its appreciation to the donors or their representatives for their presence here; to the company executives for their attendance to receive the awards on behalf of their company; and to thank the executives of those companies who have found it possible to arrange for the attendance here of the individual winners of the prizes.

The Committee is particularly grateful to the donors for their generosity in offering these awards.

Appreciation is also expressed to the individuals who took part in the contest. It is hoped that those who were not so fortunate as to win a prize this year will try again.

On behalf of the Prize Awards Committee, and I would like to say here that the other members are Mr. Thomas N. McCarter, your President, and Mr. James E. Davidson, I congratulate the winners of this year's prizes and thank you for your attention.

The Eye Specialist and the Better Light-Better Sight Program

By M. J. Julian
President, Better Vision Institute

An address before the First General Session of the Third Annual Convention of the Edison Electric Institute, Atlantic City, N. J., June 3rd, 1935.

IT WAS just a year ago today that I made my first contacts in a large way with the utility group. At that time I was a guest at the Edison Electric Institute convention, and I came down primarily to see the dramatic exhibit of the Better Light-Better Sight Bureau. At the time I was very much impressed and very much interested with the demonstration. As you will recall, that demonstration showed the growth which the Better Light-Better Sight movement had made during the previous year. As I have just said, I was impressed, but a little bit skeptical. The optical industry didn't know too much about the utility industry. We had been reading and getting most of our information from the newspapers, and, unfortunately, we weren't getting too much of a constructive nature. I assume, judging by your Chairman's remarks, that a lot of that information was coming out of Washington.

So, as I said, we were a bit skeptical, and we tackled this problem of cooperation with the electrical and with the utility industry with a little bit of skepticism. However, during the past year, we became completely convinced that the utility group is a square-shooting, hard-hitting organization, and we are playing ball with that group because we see in the cooperation a chance to do ourselves a lot of good and at the same time to do the utility and electrical groups a real benefit.

To give you a little picture of our position, let me just explain briefly that the optical industry, or the Better Vision Institute, rather, represents the optical industry as a group; it is a virtual trade association. We have the manufacturers and the wholesalers, then we have the various groups at the distributing points, the optician who fills your glasses and the optometrist who examines your eyes, and the oculist who not only examines your eyes but operates if it becomes necessary. So, we represent that cross-section group. All told, there are approximately 30,000 operators in that field, most of whom, of course, are at the retail point. We have approximately sixteen manufacturers who dominate the field, but through the Better Vision Institute we represent about 90 per cent of the manufacturing strength, about 83 per cent of the wholesale strength, and we have approximately 2500 retail members on our lists.

MR. JULIAN

We believe the members we have are the more progressively minded and the more promotionally minded in the field. Obviously, a lot of our people are strictly professionals and they can't be tied down to any operation such as ours, which is obviously a business promotion endeavor.

With that picture, when this Better Light-Better Sight movement came up we were very much interested. We were interested primarily to see that the optical industry got its proper share of the possible benefits from the movement. We were likewise interested in seeing that the movement, whether we participated or not, was conducted on a thoroughly constructive and professional basis. We became thoroughly convinced that all groups, the utility group, the electrical group, the paint group and other groups, are trying to do this cooperative job in a thoroughly constructive manner, and because they are, we as an institute have been able to organize our profession and our industry to do a job which we believe in time will be of inestimable benefit to you.

Through the Better Vision Institute we have promoted the idea of light prescribing. In other words, we are just beginning now to educate optometrists and oculists and opticians to the idea of prescribing light, including the light recommendation along with the lens recommendation. That is going to be a big job and it is going to take time to put it over. At the present time we have the cooperation of both branches of the profession. We have their leaders who have endorsed the movement, and at the present time a progressive response throughout the country. The idea is being used. It has been presented already to two of the national groups and, later this month at Miami, the American Optometric Association will present details of the program. In the meantime, nine hundred salesmen, representing all manufacturers in the industry, and all wholesalers in the industry, whether they are members of the Better Vision Institute or not, have been notified of this entire project and are now being encouraged to push the sale of the idea and the sale of the equipment that goes with it.

In the back of this room your committee has set up a little model examining room in which they will be glad to examine for light the eyes of any man in this room. I think you will be very much interested to examine the equipment and to see this light prescribing portfolio which will be on exhibit there, about which I am going to give you just a few details in a minute.

I think you will be interested in going through the routine of light prescribing that the doctor will follow in a thoroughly professional manner from now on. Two or three demonstrators will, I understand, be in that little exhibit room during the course of the convention and you are all invited to participate, at least to examine the equipment and get a little closer to the idea which in time ought to mean a lot to your particular income.

We estimate that during the current year approximately ten million people will go into professional offices for examinations. Now that figure is derived by figuring 30,000 practitioners, one examination a day, and I can tell you that the average is nearer three throughout the country, so that you have ten million potential customers who will be told to get more and better light for their various visual tasks. At the same time our professional group has mailing lists which include approximately 40,000,000 names.

Now one of the things that our group does do in a promotional way—unfortunately, they are not too progressive as promotion men; they have that professional complex—but they do use a series of follow-up letters, so-called one, two, three, four and five-year letters, so that within the course of a year every year all previous patients of these doctors are contacted with some message or other and it is going to be our job at the Better Vision Institute to try and inject this Better Light-Better Sight thought into all those contacts from now on.

Incidentally, we are promoting the idea through our own publicity medium. I think some of you already know we use approximately 200 radio stations a month, that is, we get the cooperation of these stations. We don't buy the time, but we do sponsor a series of celebrity talks on eye care, and at the present moment they are all adhering to this one theme of Better Light-Better Sight.

Everything released from the Better Vision Institute, everything we have released during the past six or eight months, has been tied down to this one idea. We think it is the best idea that has come to us and we think it is one of the best ideas that has come to you. As a professional group we believe that great profit possibility is in it. We believe that we can render a better service to our patients and we believe we can benefit by your own cooperative advertising and also through the national advertising of such companies as General Electric and Westinghouse. Incidentally, those two companies have been of considerable help to my work, and I want to thank them very sincerely at this time, and I also want to thank Merrill Skinner and Glen Trumbull for their splendid cooperation. I think it has been largely due to their efforts that this movement has been kept on an even keel.

There have been a lot of battles and a lot of political situations that have developed, but due to level-headedness and straight-thinking we have been able to keep the entire project where it belonged.

As I have said, approximately ten million people will go into professional offices this year and be told this Better Light-Better Sight story, and then we have the supplementary list of 40 million names who will be contacted during the year, and we are trying at the Institute with educational booklets and educational propaganda to stress the lighting phase of an eye examination.

I want to give you a little idea, which we have for educating our people. We have designed a book, and I hope you can see it (displaying); the cover just says "Light It." It will contain approximately 32 pages. In it we will attempt first of all to give our people a preliminary idea of what this light business is all about. Please remember that our group is entirely professional. We felt at the Institute that the first thing we had to do was give our people a sufficient background so they could make a practical demonstration of light and stand back of it. So in the first four pages of the book, very sketchily, we illustrate the history of light. We do it with illustrations. Step by step, we have sixteen illustrations there that illustrate the different stages in the development of light. We do it pictorially in a large way because we don't want our people to get involved in too much heavy reading.

In the next two pages we bring light inside and we show the various work situations in which artificial light and in which eyes are largely used. For example, here is a lady reading; here is a man at a work bench with a micrometer in his hands; here is a little girl studying; here is a man at his desk; here is a young lady at a typewriter, and there is a draftsman and a young lady sewing. We have taken the more common tasks and illustrated them. We explain that we have developed light to the present stage and we use it most of the time. We have moved indoors so that light is a vital part of our daily routine.

Then we explain in the next two pages that despite the fact that light has reached the marvelous stage of perfection, there are still factors in it which can harm. We can use light intelligently or not intelligently. We explain here, in other words, the factors of light such as glare and diffusion and direction and shadow and so on. We say that light can harm or help, depending entirely on how you can use it.

In the next pages we give a scientific background for the prescribing of light. We give the scientific factors that determine light requirements. We stress the major factors of proper seeing, the eyes of the object, the contraction of the object, the time available for seeing, and the brightness of the object. Then we support our contentions with a couple of scientific charts, and for the first time we bring the light prescribing routine into the professional man's office. Briefly, we review his near-point test and his far-point test, and we explain that, of course, he has known all about lighting in the past. We have to do that so we do not offend him. We have to point out that unfortunately, up to the present time, he hasn't had the tools with which to make any lighting recommendations other than in a general way. Of course, he has been conscious of the importance of light and better seeing, but he hasn't had the tools, and, therefore, all he has been able to do is make recommendations.

Then on the next pages we point out very briefly what happens at the present time because the lighting factor has been ignored. We show a doctor completing an examination, and a patient has glasses and is entirely satisfied, and leaves the office feeling that the glasses are going to be cure-alls and they are going to cure all of her ills. So she goes to the office where she is a bookkeeper and later on she goes home, and she likes to sew and play cards and read. Unfortunately, the glasses don't cure all of her troubles and she develops the same headaches and eyestrain and nervousness and the upsets she has been complaining of in the past, with the result that she takes the glasses back to the doctor, the doctor loses prestige and invariably has to make a new set of lenses to correct the deficiency in light. We sympathize with the doctor because he has those troubles today, and we say the remedy is to make an intimate occupational analysis of all the patient's habits, and when

a patient comes in, obviously the case history is taken in a specific way, but now dig into it, find out what that patient does at the office, at home, and wherever the eyes are used to any real extent. We illustrate eight different situations to carry out the idea.

And then we introduce the set of new vocational test cards. In the past, I think most of you have been familiar with what the doctor has been using. He has one test type card which he uses for near-point tests, then he has his distance charts which he uses for distance tests. Now we multiply that test task into sixteen different specific phases. We introduce a section from a music page, a section showing cards, playing cards, a section showing black cloth with white thread sewn on it and white cloth with black thread sewn on it. We have a section from a draftsman's blueprint and we have a page from a stenographer's notebook and a series of figures from an adding machine, and so on, sixteen of those different phases. In other words, we place in the doctor's hands the specific means whereby he can tie down the examination to the task in question.

On the next page we introduce and explain the new light testing and light prescribing equipment which is on exhibit in the rear and which you can play with later on, I am sure. Then we say to the doctor, "Now, with this new equipment, new analysis, new cards, you can intelligently and more completely render an eyesight examination; you can include the light factor which has been hurting you in your previous prescriptions," and we take the doctor step by step, pictorially, through this new routine of prescribing light, along with the lenses and frames and mountings.

Then we next introduce a light prescription. Up to the present time there has been no prescription for prescribing light, and we introduce an entirely new prescription which we are going to provide to these examiners without cost. On the face side of that prescription we list the eye tasks, such as dressmaking, stenography, typing, bookkeeping, and so on down the line. Then we have panels in here so that the doctor can put in the lighting recommendation, showing that the patient needs not less than so much, not more than so much, and also specify the preferred intensity. This routine had been developed by our own professional people before the Better Vision Institute released it. Before it sponsored it we submitted it to the President of the American Optometric Association, the President of the Dispensing Guild of Opticians, the President of the Wholesalers Association, the Manufacturers Association, and at the same time to several of our optometry schools as well as to the American Optical Company, Bausch and Lomb, General Electric and Westinghouse. We have had this approval so your viewpoint and our viewpoint were entirely safeguarded and this work was entirely constructive.

On the reverse side of this prescription form we introduce a home light testing guide in which we show a shaded area, and we ask the patient to read, with the new glasses which she has been provided, a card with the shaded sections, going from the extreme light to the dark light; and if it happens in the office, under the proper lighting conditions and with the proper glasses, she can probably read line 25, and she takes that card home and unfortunately, under the poor lighting at home or office, she can only read line 16, so that on the facing column we explain to her that obviously, with this condition, she must visit her lighting specialist and the lighting specialist will guide her.

There is a complete column on how to get Better Light-Better Sight information—"In your case, we suggest you see your lighting specialist who will be glad to guide you."

Then on the next two pages, for the doctor's own information we explain very definitely, with illustrations, how to achieve better light for better sight. We say, "You can do it in three ways, through adequate lighting (we illustrate that), through scientific painting, and lenses of absorptive glass."

On the following pages, the last two pages, we summarize quickly the benefits from Better Light-Better Sight, which is pretty well told in the caption, "Better light plus better sight means greater comfort, happiness, efficiency, success," and so on.

In the back of the book we plan to enclose a pocket so that we can put in a couple hundred of these light prescriptions. There is the back side and there is the front side (displaying), and at the same time we plan to provide our doctors with a packet which contains all of these cards. There is a sample of a newspaper and a telephone book page, white thread sewn on black cloth and black thread sewn on white cloth, playing cards, sample music page, draftsman's page, and so on. There will be sixteen of these reading tasks, so the doctor is completely equipped to conduct this examination routine according to the new technique.

Very briefly, that is the contribution which the Better Vision Institute and the optical industry has to offer to the electrical group and the utility group. We believe very frankly and very definitely that because we can sponsor light as a professional group, we can make it believable.

As I understand it, the average home works under a light intensity of three to four foot candles, and according to the recommendations we have in here, that can be jumped to twenty, thirty, forty, fifty and so on. We believe that coming from a professional group sponsorship means so much more than if it came from your group, and we are going to ask that you cooperate with us to keep it on the right basis, keep it constructive and keep it professional, because unquestionably we have a selling job ahead of us to get this light prescription program accepted by the rank and file throughout the country.

The Effect of Service Standards on System Design

(*Continued from page 276*)

examine our systems carefully to determine if the tendency has been to increase the investment cost in order to reduce the cost of operation and maintenance; it may be more economical to expend more on operation and maintenance and to have lower capital cost without reducing the quality of service. Has a proper balance been established in this respect? Needless to say careful judgment must be applied in making such analysis.

Much of the criticism that has been directed at this industry is unfair and not justified. Perhaps we should regard it as a new form of competition and for that reason be more than alert in meeting changing conditions and in taking advantage of all of the latest developments of the art which will tend toward lowered overall costs with no attendant reduction in quality of service.

I know of no group more capable in meeting changing conditions than the competent and resourceful men of the utility industry. When low cost systems can be built and good service rendered therefrom, these men will be the leaders in that field. They will not have to be told how it can be done.

New Business Horizons Through Vapor Illuminants

By Samuel G. Hibben

Director of Applied Lighting, Westinghouse Lamp Company, Bloomfield, N. J.

An address before the First General Session of the Third Annual Convention of the Edison Electric Institute, Atlantic City, N. J., Monday morning, June 3, 1935.

"If there were dreams for sale, what would you buy?"

IF the average thoughtful user of man-made light sources were to select an illuminant best suited for his present and future needs, or perhaps were to choose a plurality of artificial light sources each destined to fulfill a particular and somewhat critical service, he might be surprised to discover the many favorable qualifications possessed by the types of metallic vapor lamps recently commercialized or in process of development.

In the job of conquering darkness the hot wire tungsten filament lamp has been the supreme force for several decades. It is expected to continue so for an indefinite time. On account of divisibility of sizes, of light source concentrations, and of low unit costs, together with slowly rising quality features, the modern incandescent lamp cannot be said to be doomed—but rather supplemented —by the vapor lamps, much as the aeroplane is a supplementary item in vehicular transportation.

From the broad viewpoint, however, the filament lamp is inherently lacking in its ability to generate light with any particular emphasis on some chosen color quality, and limited in its ability to generate light quantitatively at any remarkable increase in present day efficiencies. Some types of vapor lamps are not so limited. It is with these rather outstanding qualifications that the vapor lamps seem better qualified to take up the load of extraordinary or super-service lighting.

A glimpse at filament lamp progress will more clearly establish the comparisons with the metallic vapor lamps of the past year's development. When the light source is a hot wire then, in general, the melting point of that material places the top limit on efficiency of light output. Burning at half the temperature of the sun's outer surface, the tungsten wire of the 1000-hour Mazda lamp

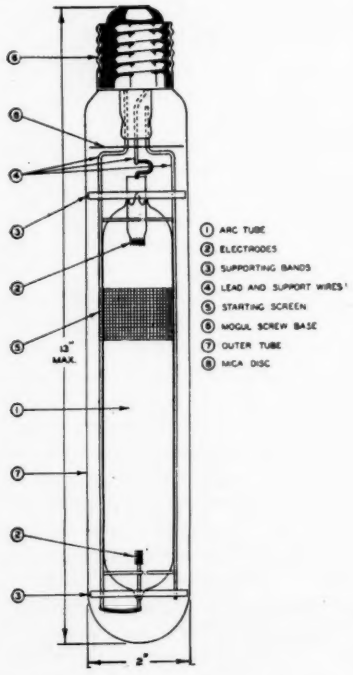
MR. HIBBEN

operates at some 2800°C. and would normally melt at 3400°C. At this operating temperature the efficiency is on the order of 21 lumens per watt. At the melting point we can calculate a tungsten wire illuminant would produce some 45 lumens per watt. Somewhere between these two efficiencies would seem to lie the optimum output capacity of the present form of incandescent lamp.

However, let it not be said that progress with Mazda filament lamps has ceased nor even slowed down in recent months. In spite of the physical limitations of melting or evaporation, one may note that since 1928 there has been an increase of approximately 8 per cent in the light-generating efficiency of the standard tungsten filament Mazda lamp and, discounting radical changes, there seems to be every indication of a slowly rising curve of future efficiency increases. For example, the improvements in alloys of tungsten metal and in quality of wire plus great advances in the uniformity and concentration of coiling and mounting within the lamp bulb have made for efficiency and better service because of the reduction of heat losses and of wasted light. Improvements in gas mixtures and pressures have done much to add to these betterments of output, maintenance, and life. Looking ahead one may glimpse the possibilities of more viscous heat-blanketing gases surrounding tungsten filaments, and a continuation of all these mechanical perfections that must result from expenditures of millions of dollars and which, even though measured in gains of only fractions of lumens per watt, still represent billions of dollars in improved artificial lighting.

Meanwhile, and for years past in the lamp research laboratories of America and Europe, there has been a quiet but persistent activity to develop commercially practical illuminants operating, not by direct transfer of electrical energy to radiant energy through the medium of heat, but to make use of the radically new application of light production, namely, the ionization of the atoms of a metallic vapor. This principle has long been known, but there have been many mechanical deterrents and several physical hurdles standing in the way of producing an inexpensive, efficient lamp.

In the simplest form these new lamps consist of two electrodes within an exhausted glass tube or bulb, the same being filled at very low pressure with a secondary inert gas-like neon or argon and with a carefully controlled amount of some pure metal, mercury, sodium, cadmium, etc. Under the impressed starting voltage there occurs a preliminary arc discharge between electrodes and since the latter are coated with a material capable of emitting a rich stream of electrons, there occurs a peculiar phenomenon that may be likened to a continuous firing of a cloud of minute machine-gun bullets from the negative electrode or cathode. Perhaps a better analogy would be a dust-storm or tornado, substituting electrical "particles" for dust.

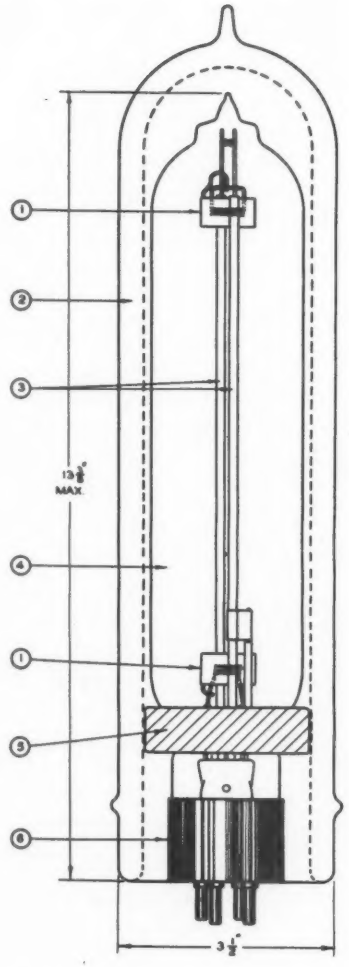


The 400-watt mercury lamp

As the temperature soon rises, the metal vaporizes, the pressure builds up, and these "bullets" or electrical charges traveling at high speeds, probably in excess of 1000 miles a second, may be thought of as colliding with some of the vapor atoms and knocking loose from them a certain percentage of the outermost electrons. When these dislocated electrons (ions) fall back to their former normal orbit of movement around the nucleus of the atom (the proton), then infinitesimally brief sparks of energy are released in the form of radiation or light. Sufficient heat is generated to maintain some of the metal in the vapor state, but the metal does not shine in the way that we have been accustomed to think of a hot, black body. No metals can be employed which vaporize at temperatures higher than the softening point of the enclosing glass bulb (some 780° C.). Thus essentially this production of light is entirely different from the radiation associated with an incandescent solid.

Each metallic vapor possesses its own peculiar and characteristically different quality or color of light when thus ionized. And it is this "finger print" or immutable color characteristic that makes the vapor lamp so peculiarly interesting for commercial usage.

When a suitable glass was developed that could withstand the etching action of hot sodium vapor, the sodium lamp developed rapidly. In its present form it seems best adapted to the multiple and series AC circuits, for certain types of floodlighting, and essentially for highway lighting. As is well known, the nearly monochromatic yellow color corresponds with the quality (wave-length) of light to which the human eye is most sensitive. It is also a fact that at the prevailing low intensities of highway lighting there is very little color discrimination. With the maximum of visual acuity, the discernment of objects by reason of dark versus light contrasts leads to maximum seeing ability. If the research scientists had set forth to design the lamp of optimum quality for average rural highway lighting service he could scarcely have found a light source more ideally suited for the job.



The 6000 lumen sodium lamp

Combination Mercury-Mazda lighting providing 20 foot candles of near-white color

In the two commercial sizes now available, namely, 6000 and 10,000 lumens, respectively about 135 watts and 200 watts, it is possible to achieve wholly satisfactory highway illumination on the basis of roughly 25 generated lumens per running foot of roadway, or in the case of the 6000-lumen lamp with about 22

units to the mile. This is optimistic, but good practice of not more than 250-foot spacing and not less than 0.2 horizontal foot-candles average.

The sodium lamp is a unit of comparatively large light source area, which makes exact control or distribution more difficult, but which aids materially in reducing glare. Given such a distinctly new unit, patently visible to the public as an extraordinary development, one senses the importance of seizing upon the occasion to take advantage of an improved technique and practice in highway lighting in general. Commercially it seems important to contemplate sodium lamp installations on the basis of higher mounting heights than has been past American practice; on the basis of much higher foot-candle intensities on the road surfaces, and on the basis of exploiting a new source in the services of making our inter-city thoroughfares safer for vehicular travel and much more efficient routes of transportation. "New Business Ahead" is the sign that the electrical industry should see in place of the discomforting one, "Danger Ahead," that the motorist and taxpayer may expect to find on our unlighted highways.

One estimate of new business possibilities is based upon the fact that this country annually experiences 11,000 fatal rural highway accidents during the hours of darkness, of which some 5500 could be avoided with such lighting as outlined, provided it were installed on the most important 20,000 miles of automobile thoroughfares. Perhaps, also, this savings can be translated into more than $50,000,000—ample to pay almost doubly for all of the lighting costs. Journeying toward our new business horizons we may meet and shudder on the Macaber message, "It costs to kill!"

It has been previously pointed out that the present cost of sodium lamp equipment may run a little higher than a corresponding wattage of filament lighting installations. Nevertheless the engineer predicts a further perfection of sodium lamps in the direction of longer life and a lessening of equipment cost that inevitably comes with volume production and standardization, to the end that future rural highway lighting business might be predicted to be with sodium lamps, if at all.

View of a sodium highway lighting test installation

Concurrently with the early progress made with sodium vapor during the past two years, the industry has awakened to the companion vapor illuminant, the high intensity mercury lamp. This illuminant differs radically from the mercury vapor tube sources of familiar usage in that it operates with a pressure of vaporized mercury on the order of 1000 times higher, namely, no less than atmospheric, and emits light at two to three times the former efficiency, being now commercially rated at easily 35 lumens per watt. So far but one commercial size has been generally used in this country, namely, 400 watts. The deterrents of slow starting and the time delay before re-ignition in the case of current interruption seem to be out-

TABLE I—ESSENTIAL DATA—SODIUM LAMPS

Lamp Rating	6000 Lumens	10,000 Lumens
Watts (excluding aux. equip.)	135	200
Bulb	T-20	T-24
Base	4-Pin Industrial Tube	(Same)
Burning Position	Any	Any
Nominal Life	2000 Hours	2000 Hours
Max. Overall Length (excl. pins)	13 3/8 in.	16 in.
Light Center Length (excl. pins)	7 1/2 in.	9 in.
Auxiliary Equipment	Transformer and Relay	(Same)
Cathode Volts	2.4	2.5
Cathode Amperes	10.0	10.0
Lamp Arc Voltage	24.0	28.0
Lamp Arc Amperes	5.0	6.6
Vacuum Flask Outside Diameter	3 1/2 in.	4 in.
Vacuum Flask Overall Length	14 5/8 in.	16 5/8 in.

Under sodium highway lighting the visual acuity is maximum

weighed by a relatively high efficiency and a greenish yellow quality of the light that is acceptable in many industrial plants.

Being deficient in red, the present mercury lamp has on occasion been combined with about an equal wattage of standard Mazda filament lamps and the resultant mixture approaches daylight quality, although it must also be remembered that the output of the metallic vapor lamps consists of broken or discontinuous spectral bands and that from any known lamp of this nature there will be missing certain specific colors. On the research horizon we glimpse possibilities of mercury amalgams with other metals or of certain gases by means of which the gaps in the spectrum may be partially filled. But withal, the high intensity mercury lamp seems more applicable as a "worklight" rather than a "selling light" in merchandising establishments, or than a "beauty light" in the residential library.

None will deny that a high efficiency illuminant, if properly recommended and applied to industrial lighting, engenders curiosity and interest and gives to the user a sense of modernization, hence lowering normal sales resistance. Such has been the experience in this country, where during the past few months of promulgation there have been placed in service approximately 4000 mercury lamps. Practically all of these are found in the automotive and similar large metal-working industrials.

There seems good reason to predict in the light of European experiences where the sales have been almost entirely confined to street lighting and where the number of mercury lamps installed has reached a figure several times greater than in the United States, that this type of lamp will find a field for use on business and residential streets. It gives promise of still higher efficiencies in larger wattages, suggesting the floodlighting of gardens, gasoline service stations, and neutral-colored buildings.

As in the history of any illuminant producing more light for the same power consumption, the sale of lighting power has not decreased, but rather the quantitative standards of illumination have been raised. An interesting characteristic of practically all of the mercury lamp installations made to date under the guidance of the Mazda lamp manufacturers has been the high foot-candle intensities. This, then, may suggest the keynote for the industry when applying these new sources.

The business possibilities with vapor lamps should not be surveyed without reference to the need of the highest grade of intelligence on the part of the lighting engineer and his familiarity with the comings and shortcomings of these new illuminants. They are not foolproof. They require careful selling and some new technique if their use is to be with the utmost satisfaction to all concerned. The utility will wish to guide their inauguration, for one common misconception in the casual user's mind is the idea that the more efficient source should "reduce the bill"—which does not necessarily follow.

The greater the intensity we desire to use, the more careful must we be to distribute the light correctly and to shade the light sources themselves. The more advanced we become in expert service to the customer the more we must analyze his specific visual task and adapt a color quality to that task that may or may not be the one rather yellowish color of light so far procurable from a hot wire. For if a man's character may be judged by the lighting he has, and his culture by the nature of the illumination with which he beautifies his surroundings, then will the services of the public utility be measured by the intelligent utilization it makes of all possible lighting tools within its grasp or knowledge.

TABLE II—ESSENTIAL DATA—MERCURY LAMP

Bulb	Tipless T-16
Base	No. 401 Mogul Screw
Max. Overall Length	13 Inches
Starting Volts	220
Arc Volts	135-160
Watts	400 10 per cent
Lumens Per Watt	35 10 per cent
Average Life	1500 Hours
Light Center Length	7¾ Inches
Burning Position	Vertical
Finish	Clear

Average lumens through rated life in per cent of initial, 80.

Miss Swann Now with Woman's Magazine

MISS ADA BESSIE SWANN, Home Service Director of the Public Service Electric and Gas Company, Newark, N. J., has resigned that position to go with the Crowell Publishing Company as Director of the Food and Equipment Experimental Center of *Woman's Home Companion.*

Under Miss Swann's leadership, home service work in the Public Service Company made notable progress and proved highly effective. She was a pioneer in radio broadcasting, her department being among the first to go on the air to reach the home.

A price list of publications of the Institute will be sent upon request to

EDISON ELECTRIC INSTITUTE
420 Lexington Ave., New York, N. Y.

Recommendations by Better Light-Better Sight Bureau

MANY utilities have asked for suggestions on how to organize a local Better Light-Better Sight Program. Others are asking for suggestions on something new. The following is offered in response to these requests and to others who may be interested. While being far from all that can contribute to a well organized program locally the list is comprehensive enough to be helpful in preparing a broad Light for Seeing activity. The suggestions are brief, leaving the details for local initiative and planning. Set up in "check list" form the Bureau is hopeful that the suggestions will prove of assistance in developing more intensive local plans by utility executives.

Lighting Sales Department of Utility

I—Sales power for homes, stores, offices, public buildings, schools, factories, highways and exteriors
- a. 5,000-10,000 residence meters per sales person
- b. 1,500-2,500 commercial and industrial per sales person
- c. Follow new construction as well as present customers

II—Supervision for sales power
- a. Supervisor to each 10 or 15 sales persons

III—Equipment for demonstrations
- a. Home lighting and commercial lighting kits
- b. Light meters and Sight-Lite Tester Kits
- c. Demonstration room at headquarters
- d. Provide for demonstration equipment to be loaned to prospects

IV—Training sales power
- a. Company personnel
  1. Regular training and practice schools
  2. Lighting Institute conferences
  3. Correspondence School courses
  4. Regular sales meeting follow-up
- b. Retail trade
  1. Lighting Institute conferences
  2. Local lighting conferences
  3. Correspondence School courses
  4. Regular contact by utility supervisors

V—Prepare Advertising program—*One theme,* Light for Seeing
- a. Newspapers
- b. Radio
- c. Bill stuffers
- d. Direct mail
- e. Literature
- f. Sell Light *for Seeing*

VI—Promotion
- a. Lectures
  1. Select and train speakers
  2. Obtain engagements
  3. Follow up prospects
- b. Contests
- c. Education of Company employees
- d. Education of associated trade employees —particularly department store people
- e. Displays
  1. Window
  2. Permanent Light for Seeing Exhibit
  3. Better Light-Better Sight Shows
  4. Stunts
- f. Publicity on
  1. Meetings
  2. New facts
  3. Human interest stories
- g. Cooperation with Sight Saving activities

VII—Cooperation with Electrical Trade
- a. Fix policies that are fair to all
- b. Lend sales aid to contractors and fixture dealers in closing sales
- c. Assist in selection of quality merchandise
- d. Make it easy to install trial installation

VIII—Cooperation with Non-Electrical Trade
- a. Reciprocal education of personnel
  1. Electrical group find out about optical and paint partnership in seeing
  2. Electrical group help instruct optical and paint groups on lighting.
- b. Exchange leads with paint and store equipment outlets
- c. Help organize local Better Light-Better Sight Bureaus or Committees or Sight Saving Councils
- d. Really cooperate—*give* as well as take

IX—Organize Program
- a. Establish quotas and budget expense
- b. Establish a time schedule for activities
- c. Tell the industry of your plans and encourage participation

X—Set a good example
- a. Check lighting of Company buildings
- b. Encourage all employees to set a good example in their own homes

XI—Don't Wait—Start Now!

Better Light-Better Sight Bureaus or Committees

I—Encourage complete cooperation between various interested groups
- a. By stimulating intereducation of personnel
- b By serving as a clearing house to correct misunderstanding
- c. By showing each group the benefit to them of cooperation

II—Correlate the advertising of all interested parties
- a. As to timing
- b. As to cross references to other groups
- c. As to use of Better Light-Better Sight slogan and insignia

III—Establish Speakers Bureau
- a. Prepare suitable talks accurate as to facts
- b. Select and train speakers
- c. Obtain engagements

IV—Utilize facilities of Associated groups to collect facts
- a. Joint seeing surveys of industrial plants by paint, optical and utility representatives
- b. Correlation of local accident records with lighting conditions
- c. Correlation of progress of school pupils with lighting conditions

V—Sponsor Better Light-Better Sight Shows

VI—Assist Better Vision Institute in promoting use of Light Prescribing Technique and Equipment among local optical interests

VII—Pool advertising and publicity resources of group

VIII—Sponsor Better Sight Week during September considering possibilities of
- a. Synchronized window and store displays
- b. Synchronized advertising and publicity
- c. Opening of Better Light-Better Sight Show
- d. Proclamation by Mayor
- e. Cooperation with safety interests
- f. School essay or poster contest
- g. Coordinated sales activity by each branch

IX—Popular voting and window display contest on Better Sight Lamps with and through department stores, furniture stores and other dealers

X—Work steadily for proper lighting and decoration of public places, conveyances, etc.

Sight Saving or Sight Conservation Groups

I—Marshal forces of the community to encourage sight conservation in all its phases

II—Recognize the truly humanitarian aspects of sight conservation

III—Organize suitable committees to cover phases selected for emphasis and public education.

IV—Establish Speakers Bureau for addresses
before: Parent-Teachers groups
Teachers Training groups
School Assemblies
Medical groups
Nursing groups
Foreign Language groups
Social Service groups
Women's Clubs

V—Establish Publicity Bureau

VI—Prepare suitable literature and disseminate to parents, present and prospective

VII—Consider widely publicized free eye tests at intervals

VIII—Work to place every school child with subnormal vision in sight saving classrooms

IX—Endorse and work for certified lighting for
School classrooms
School dormitories
School fraternity houses
School libraries
Hospitals
Clinics
Medical offices
Public buildings

X—Engage in research on handicaps to good seeing and their social effects.

John Public and His Taxes

"Spender's All," by Ernest Greenwood, D. Appleton-Century Company, New York, $2.00.

DOES the average citizen know what taxes he pays? "Spender's All," by Ernest Greenwood, in an exposition replete with illustration and in language readily understandable attempts to give the answer.

The hero of Mr. Greenwood's book is the average citizen—John Public. John awakens in the morning, has his breakfast in tranquil domestic surroundings, meditates for a few moments on his existence and, even taking into account his decreased income, arrives at the conclusion that life is very kind. To the foreground, at this point, comes "Taxation" and throughout the remainder of the book appears in every act of spending in which Mr. Public indulges.

Unfortunately for John, he has allowed himself to be lulled into a state of narcotic blissfulness because "Taxation" has convinced him that for certain things John has contributed not one penny. Nevertheless, the cost in reality is exactly the same; for while John is waiting for "Taxation" to arrive at the front of the house, "Taxation" has already entered through the rear door.

In a chapter entitled "Behind the Switch on the Wall," perhaps John's closest friend, electricity, proves as helpless as the rest to serve him and at the same time to spare his income. This is true, not because electricity demands too much of John by way of cost, but because Government, the wizard who employs "Taxation" to perform its tasks, demands too much of electricity. For instance, "John Public paying his electric light bill of say $3.00 a month, actually pays for less than $2.58 worth of electricity and pays in direct taxes a little less than half a dollar."

The half dollar, however, is only the beginning, for then sets in the "painless" extraction, which is the consequence of John's modern notion of having his home electrified. John naively assumes that for $1,000 in money he will receive $1,000 in equipment. Actually he "got about $750 worth of equipment and paid the Government $250 for the privilege of buying them." A myriad of hands through which the products passed before they were sold to John "had paid a thousand and one tax bills all of which were passed along—until they finally reached John Public who paid them when he paid for his devices."

In a discussion of the cost of electricity, Mr. Greenwood writes that "since 1913 the average price of residential electricity—the price which John Public pays—has decreased 38 per cent although the cost of living today is 36 per cent higher than it was in 1913. But the taxes paid by the electric light and power industry have increased 170 per cent."

Among many other more or less invisible taxes which Mr. Greenwood discusses is the one imposed on insurance premiums. Here, because a person purchases insurance in advancing years with a resulting high premium charge, a younger person pays much less, while for both, the amount of protection is exactly the same. In other words "the tax which a policyholder of any kind has to pay the government for the privilege of protecting his family and his property varies with the premium paid and not with the amount of protection received."

A high point of the tax-crescendo is reached when Government driving "Taxation" about with its thundering lashes of expenditures, is discovered not only subjecting John Public to staggering tax burdens but also using that same money to embark in various enterprises in direct competition with John. One example is the "New Deal's" economic monstrosity known as the Tennessee Valley Authority.

For this "Authority," Mr. Greenwood points out, the "taxpayers are putting up another $100,000,000 or so with which to put the Government into the business of generating and distributing electricity in competition with local, privately owned electrical enterprises." While at the same time, "to compete successfully means an operating deficit of $2,000,000 a year to be paid by the taxpayers, although they won't know it because of what Professor Dewing calls the 'pernicious practice of obscuring the actual costs.'"

"Spender's All," should stir up in an inquiring mind first, a consciousness that the tax bills are high, secondly, that indirect taxes, too numerable to mention, are steadily sapping the income of the average citizen and that he is entirely ignorant of their existence, and, lastly that wasteful Government expenditures are one of the chief contributors of the existing tax burden.

Mr. Greenwood's lucid style makes clear even the most technical points of the subject matter. As a handbook on taxation, "Spender's All" contains the answers to many current questions, and with its fund of data offers a good working knowledge of the greatest income menace existing in our day. —MARTIN V. CALLAGY.

The Executive's Viewpoint

(Continued from page 256)

the residential sales field, if a really effective selling program is planned and executed with proper chief executive support.

During 1934 there were a total of 13,925 major appliances connected to the company's lines through both company and dealer sales, less than 10 per cent of which represented replacements. This total of 13,925 included 2780 ranges, or 37 for every 1000 residential customers; 9566 refrigerators, or 128 for every 1000 residential customers, and 1579 water heaters, or 21 water heaters for every 1000 residential customers. The dealers sold 53 per cent of all the ranges sold; they sold 47 per cent of all the water heaters sold, and 94 per cent of all the refrigerators sold. Because of the large number of refrigerators sold by dealers, their sales accounted for 81 per cent of all of the major appliances sold and connected to our lines during 1934.

For the year 1934 the average use of electricity per residential customer was 797 kwhr at an average rate of 6.80c. per kwhr, or $54.20 per residential customer. Using the results of the first four months of 1935 as a basis, and allowing for low summer use, it is indicated that the average use of electricity per residential customer for the year 1935 will be 950 kwhr, compared with 797 kwhr for 1934.

In the commercial classification we sold, during 1934, an average of 3197 kwhr to each commercial customer at an average rate of 6.36c. per kwhr, or $203.35 per commercial customer. Using the results of the first four months of 1935 as a basis, and allowing for low summer use, it is indicated that the average use of electricity per commercial customer for the year 1935 will be 4050 kwhr, compared with 3197 kwhr for 1934.

In closing I would like to again stress the necessity for the chief executive of giving his enthusiastic support and approval of selling activities and also emphasize the tremendous opportunity the utility had today in extending the use of the residential service through intensive selling efforts and capitalizing on the outstanding electric service consciousness of your consuming public. Chief in importance among the mechanics of accomplishing this is the conduct of a well worked-out dealer coordination plan and the confinement of the company's activities chiefly to the sale of service rather than sale of merchandise, as such, and the compensation of the utility company's salesmen upon that basis.

Progress in Oil and Gas Pipe Line Pumping and Oil Refining and Producing*

By W. H. Stueve
Oklahoma Gas & Electric Co.

Oil Pipe Line Pumping

Within the last several years there has been very little activity in the Oil Pipe Line business or in the Gas Pipe Line business in the way of large trunk line installations; since 1932 the only additions made to pumping stations were those of the Great Lakes Pipe Line Company, a gasoline transporting pipe line operating from Oklahoma refineries to Chicago and points in Minnesota.

Through the efforts of the Petroleum Electric Power Club, cooperating with officials of the Great Lakes Pipe Line Company, a total of 8,000 hp in fourteen pumping stations was connected to power utilities' lines during 1933, representing an increase in gross revenue to such power companies of $300,000 per annum. Within the last few months another addition in capacity is being made of 4,000 hp more, with a corresponding increase in gross revenue of about $150,000.

The power utilities benefited by this increase in load are located in Oklahoma, Kansas, Missouri, Iowa, Nebraska, Illinois and Minnesota.

The power rate offered by the serving utility is somewhat after the following: "$63.00 per kw per year includes demand and 8,760 kwhr. A refund of .3c per kwhr is provided for all energy not taken or consumed. Fuel Clause adjustment provided on basis of market value of crude oil. Provision for changing kw demand on a yearly basis is also provided." Meter can be read daily, monthly, or annually, and same cost arrived at.

Within the last several years the greatest activity in the Oil Pipe Line business has been in connection with the East Texas Oil Field in lines constructed to the Gulf, a distance of about 200 miles. Practically all pumping stations installed on these lines have been electric motor driven. A report recently prepared by the Petroleum Electric Power Club, based on a questionnaire submitted, indicates that 80 per cent of all prime mover horsepower is now being made with electric motors, the other 20 per cent being Diesel engine drive. Thus the tables are being reversed in that prior to our rate activity in attempting to secure the Oil Pipe Line business, the ratio of installed horsepower was 80 per cent Diesel engine drive and 20 per cent electric motor drive.

At this time our greatest source of competition in the Oil Pipe Line Pumping field is coming from the proposed use of medium speed Diesel engine gear through step-up gears to centrifugal pumps, as against the old practice of using relatively slow speed Diesel engines direct connected to plunger pumps. This latter type of installation reduces the investment ratio when compared to electric motor drive from 4 to 1 down to about 2.5 to 1. In addition to the reduced investment, considerable power or fuel is saved, and the centrifugal pump operates at very good efficiency under all speed conditions.

The ray of sunshine appearing on our horizon today seems to be the use of the direct current Thyratron Tube Motor now being developed by both the General Electric Company and the Westinghouse Company. We have been talking about this situation for some four or five years, and to date have accomplished very little in securing the cooperation of the manufacturers, but the Thyratron Tube Motor will meet our ideals and solve a great many difficulties for us.

Gas Pipe Line Pumping

No doubt, due to the depression and inability to finance propositions involving several millions of dollars, the field of activity in the Gas Pipe Line business has also been somewhat limited within the last several years and, therefore, very few installations have been made of gas pumping stations.

At the present time the largest gas reserve existing in the United States is in the Panhandle of Texas adjacent to Amarillo. There are nine pipe lines originating in the Panhandle of Texas of sizes from 18 inches to 30 inches in diameter with corresponding capacities of 100 million cubic feet per day to 300 million cubic feet per day. The daily capacity of this group of gas pipe lines is approximately 900 million cubic feet per day, which can be delivered to Kansas City, Omaha, Lincoln, Des Moines, Chicago and Indianapolis. An investigation of the actual deliveries of these gas pipe lines shows that the average delivery is 300 million cubic feet per day, or, roughly, it may be said that these lines operate at 30 per cent capacity factor, yet in terms of actual power input load factor, such load factor of all the equipment installed may be only 10 to 15 per cent, when considered from origin to destination. This fact, showing the limited amount of gas actually delivered by the existing pipe lines, is mentioned here to bear out our theory that very little business can be secured from the gas line pumping business, for the reason that stations are installed to handle roughly three times the present amount delivered.

In the past we have visualized the gas pumping business, in that it would be possible to secure the use and acceptance of centrifugal electric driven gas compressors. The ratio of investment by the use of electric driven gas compressors as against the present practice of gas engine driven reciprocating compressors, is perhaps 1 to 5, so that the use of purchased electric power for the operation of motor driven centrifugal gas compressors would be justified on the basis of the poor annual load factor of all of the installed stations. However, in this case electric power supply is not available through a greater portion of the Panhandle and Western Kansas in sufficient quantities.

The use of purchased electric power for Gas Pipe Line Pumping does not present a very rosy picture and it may be a good many years before the general adoption of electric driven centrifugal compressors.

Oil Refining

Changing methods of refining, to take advantage of modern research, have caused a great activity in the Oil Refining business throughout the

*Summary of a report before the Industrial Power and Heating Subcommittee of the Sales Committee of the Edison Electric Institute at a Meeting held in Chicago, Illinois, April 26, 1935, W. H. Sammis, Chairman.

country within the last several years. The public has demanded better gasolines and the oil companies have been forced to revamp their plants and install equipment to meet this demand and, therefore, there has been a great amount of activity and increased investments in equipment in this branch of the industry.

At the present time the Oil Refining industry requires approximately 30 per cent of its total power use in the way of electric motor driven equipment. Because of the large amounts of process steam required under a well balanced flow condition, this industry generates approximately one-half of its electric requirements and purchases the other one-half under various conditions of contract agreement.

The average refinery now being served by us, or any other power utility throughout the country, secures for connection to its lines water pumping equipment and oil pumping equipment, where it is not practical for the power to be supplied by the refinery under its existing low pressure steam plant arrangement. At this time, however, the average oil refinery manufacturing lubricating oils will consume from 5 to 7 kwhr per barrel of through-put for various processes. Along with this amount of electric energy required in the Oil Refining business, you will usually find that about 200 pounds of steam are required for each barrel of through-put for processing work.

In the cracking process now in vogue gas engine driven hot oil pumps are used requiring large amounts of power. The usual capacity of such pumps varies from 300 to 1,000 hp. A large amount of still gas with high Btu content is liberated in the cracking process. This still gas can not be condensed, but it can be used very satisfactorily on mixture with air for dilution and consumed in the hot oil engine driven pumps. The fuel supply in this case is usually considered as costing nothing since it is an unsalable by-product.

Refinery power loads average 80 per cent annual load factor, with monthly load factor averaging 90 per cent and 90 per cent to 95 per cent power factor.

Oil Production

The field of activity with respect to securing more electric load in the producing of oil is very complicated and involves a great many factors of application of power, from drilling on down to actually producing the oil from the depths. It is estimated that only about 4 per cent of the present oil wells in the United States are electrified. One of the principal reasons for this low percentage is the fact that the oil companies have free fuel available in the form of gas energy on practically all of their leases.

Oil is produced by several methods, one of which is the old conventional beam pumping unit for wells with production varying from 5 barrels to 500 barrels per day; also, by the use of a deep well electric driven submergible Reda pump unit for capacities from 500 to 3,000 barrels per day; also by the use of high pressure gas injected in the tubing and flowing fluid through the casing, or vice versa, this method allows a wide variation in volume; also by the use of a so-called Pure Sullivan Pumping Head, an essentially simple engine actuated with high pressure gas, the piston of which is direct connected to the sucker rod. The units, of course, have limitations of maximum pumping capacity of around 300 barrels per day, from wells 5,000 feet deep.

In all of the above mentioned production methods, a large amount of power is required. Many of the wells are located a great distance from high lines and in many cases the construction of high lines and necessary transforming equipment is not justified, based on the long time annual revenue necessary.

Conclusion

After analyzing the general conditions surrounding the sale of power to the above mentioned four branches of the Petroleum Industry, it will be noted that one of the greatest obstacles to overcome is the fact that the oil or gas companies have the advantage of "free" fuel in most of their operations, or fuels that are by-products or unmarketable. The next factor of importance, which is an obstacle in the way of the sale of more power, is the fact that the representatives of both Diesel and Gas Engine factories outnumber the power utility representatives perhaps 25 to 1, and are constantly seeking outlets for their merchandise.

The Petroleum Electric Power Club, an organization of Power Sales Engineers in the Mid-Continent Oil Field, has gone a long way toward working out a great many of these difficulties and by actively contacting oil company engineers, getting their side of the story, and in turn selling our executives on what the oil companies desire.

Recent negotiations conducted with representatives of oil companies and gas companies, covering projects involving the use of purchased power where they desire to replace electric motor driven equipment, indicate that money for capital expenditures is very hard to obtain at this time if the "pay-out period" exceeds one and one-half to two years.

The Electric Kitchen

(Continued from page 265)

ested customers might receive a detailed sketch with a suggested layout for the kitchen. The bureau might suggest the use of unemployed architects in creating such a local kitchen planning service.

The bureau would establish a running roster of industry men who have modernized their kitchens to include refrigeration, cooking, dishwashing, water heating, ventilating fans, electric clocks, food mixers and proper lighting and cabinet arrangements.

The bureau would encourage the local groups to train salesmen to sell complete kitchens as well as individual appliances.

If we endeavored at this time to describe for ourselves the ideal type of new business, wouldn't we specify an increased load, and increased customer satisfaction? The electric kitchen produces both.

Wouldn't we want a new load that could be utilized by a large percentage of the customers? Every worthwhile home can some day afford the electric kitchen.

Wouldn't we want a new load great enough to justify constantly lowering rates? The electric kitchen uses eight times the service of the average energy used by household consumers.

Wouldn't we want a new load that would stimulate business and employment? The electric kitchen creates new and additional employment.

Wouldn't we want a new load that could be easily financed by the customer? The complete electric kitchen can be financed through local banks on a guaranteed F.H.A. plan, and at most attractive rates and terms.

Aren't we, therefore, more fortunate than most industries in that we have an ideal and brand-new market to cultivate, which means an increased growth with no saturation?

In giving the American homemaker this greatest of our gifts to relieve her of the menial drudgery of the past, will we not also make our greatest contribution in this industry and build a new order of customer relations and goodwill?

POWER SALES ITEMS

AIR CONDITIONING

"The Principles and Practices Involved in the Controlled Conditioning of Air." Southern Power Journal, May, 1935, pp. 35-38. W. R. C. Smith Publishing Company, 1020 Grant Building, Atlanta, Georgia.

With the factors entering into the calculation of the summer cooling requirements, both listed and explained, a typical problem is solved for illustration.

"Compelled by Competition." Electrical World, May 11, 1935, p. 66. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

Air conditioning is being stimulated by competition in commercial applications. The adoption of air conditioning by one organization in any class of business compels the adoption of air conditioning by competitors in order to retain patronage. S. H. Kress are having an air conditioned store at 39th Street and Fifth Avenue, New York City, partly because of the adoption of 50 foot candle illumination for the first floor. F. W. Woolworth will have air conditioning in two Fifth Avenue stores.

"Choosing the Right Air Conditioning System," by A. W. Canney. Heating, Piping and Air Conditioning, April, 1935, p. 202. Keeney Publishing Company, 6 North Michigan Avenue, Chicago, Ill.

Fundamental considerations—Relation of air conditioning to heating system.

"Air Conditioning for Beauty Shops." The American Hairdresser, May, 1935, p. 58. H. R. Howell Publishing Company, Inc., 386 Fourth Avenue, New York City.

Marked increase in volume of business and more regular patronage result from air conditioning.

"Air Conditioning for Laundries." Laundry Age, May, 1935, p. 68. Laundry Age Publishing Company, Inc., 1478 Broadway, New York City.

Ironing operations speeded up and production of plant improved by air conditioning.

BREWERIES

"Diesel Engines and Modern Methods Characterize New Oklahoma City Brewery." Southern Power Journal, May, 1935, pp. 27-29. W. R. C. Smith Publishing Company, 1020 Grant Building, Atlanta, Georgia.

The power plant of this new brewery consists of two Diesel engines with a combined rating of 980 horsepower.

"Power At Work in Industry." Electrical World, May 11, 1935, p. 61. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

Economies which can be effected in breweries by modernization of practices and/or of equipment, which were discussed at length in the February 2, 1935, issue of Electrical World, show that even with a 6 per cent increase in brewing, the coal consumption was reduced 59 per cent, steam consumption 62 per cent, local power generation 100 per cent, and city water consumption 45 per cent. This article was based on the experiences of Gilbert Wilkes, Consulting Engineer. A table is included showing the distribution of costs for electric service and steam service.

DIESEL ENGINES

"Diesel Plant Bid $200 per Kw." Electrical World, May 11, 1935, p. 56. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

Analysis of bids submitted by five Diesel manufacturers for a nominal 1750 kw plant to be built by the U. S. Indian Irrigation Service. Bids ranged from $197.67 to $213.08 per kw.

"Oil and Gas Engines." Power, April, 1935, pp. 178-181. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

An interesting article that presents a Diesel engine maintenance schedule, together with a list of Diesel plant supplies.

"Diesel Maintenance Pointers." Power, May, 1935, pp. 260-261. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

A few notes on the operation and care of Diesel engines to supplement a chart on Diesel maintenance.

"Diesel Engines in the Mining Field." Electrical News & Engineering, April 15, 1935, p. 43. Hugh C. MacLean Publications, Ltd., Publisher, 347 Adelaide Street West, Toronto, Ontario.

Small Diesel engine installations provide cheap power in many Canadian mining fields.

ELECTRIC FURNACES

"Electric Enameling Extended." Electrical World, April 27, 1935, pp. 35-36. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

This article describes the experience of a manufacturing concern with substituted electric enameling for fuel-fired furnaces. It was found that the first costs of comparable fuel-fired and electric furnaces were about the same and that the final decision depended upon the operating costs and quality of products. The energy cost of the electric furnace was somewhat higher than the fuel-fired furnace but the availability and very small maintenance cost made the total operating cost about equal. The quality of the work produced in the electric furnace was such that the company did not feel it could be bettered.

The monthly usage of electrical energy prior to the installation of the electric furnace was 75,000 kwhr and the maximum demand between 350 and 400 kva. The installation of one furnace increased the energy consumption to 290,000 kwhr per month and the demand to about 860 kva. The monthly energy consumption with two furnaces has been estimated at 530,000 kwhr and the demand at 1600 kva.

"Electric Furnaces for Production of Fertilizer." Chemical & Metallurgical Engineering, May, 1935, p. 264. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

TVA has put two 6000 kw furnaces in operation for production of phosphates.

ELECTRIC MOTORS

"Electric Motors for Steel Mills." Iron & Steel Electrical Engineer, May, 1935. Association of Iron and Steel Electrical Engineers, Publishers, 1010 Empire Building, Pittsburgh, Pa.

Proper selection and necessary characteristics of motors for steel mill applications.

"Electrically Operated Leather Press." Hide & Leather, April 27, 1935, p. 7. Jacobsen Publishing Company, 300 West Adams Street, Chicago, Ill.

New leather embossing press operated by 16 hp motor and thermostat controls has pressure range up to 500 tons.

POWER PLANTS

"Engineering Practice in Textile Power Plants." Southern Power Journal, May, 1935, pp. 24-26. W. R. C. Smith Publishing Company, 1020 Grant Building, Atlanta, Ga.

The textile industry offers a splendid opportunity for the economic coordination for steam and power generation and utilization, with process steam requirements permitting the cheap generation of electric power.

PURCHASED POWER

"Buys Power to Save 26 Per Cent," by F. W. Bailey. Power, May, 1935, p. 233. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

Cost of power services to the 15-story Cincinnati Traction Building, designed for future addition of three stories, was reduced $6,434 a year by changing from generated to purchased power and by changes in elevator equipment and operating methods.

SEWAGE PUMPING

"An Engineering Analysis of Proposals for Sewage Pumping," by H. S. Knowlton. Southern Power Journal, May, 1935, pp. 44-45. W. R. C. Smith Publishing Company, 1020 Grant Building, Atlanta, Ga.

Of interest to engineers required to analyze pumping station economic problems are the supporting data and summary prepared by an engineering firm in connection with a recent study of the power phases of a sewage disposal problem confronting one of our medium-sized cities. In making an analysis of the cost of modernizing the pumping station from the power standpoint, the following plans were considered: (1) Use of purchased power, holding the existing equipment for peak service and using new pumping units for normal operation; (2) Use of purchased power with all new equipment; and (3) Use of a Diesel-engine-driven plant.

WELDING

"Arc Welding Progress." Electrical Production, May, 1935, p. 2. Electrical League of Cleveland, Inc., Publishers, Builders Exchange Building, Cleveland, Ohio.

Concise description of the development of arc welding.

Public Utility Act of 1935

(Continued from page 243)

1. It may direct the company to establish physical connection of its transmission facilities with those of other persons, either upon application by such other person or by a State Commission (Section 202 (b)).

2. It may direct the company to sell to or exchange energy with any other person engaged in the transmission and sale of energy, upon application by such persons or by a State Commission. (Section 205 (e)).

The Commission can issue an order directing the interconnection of facilities or the exchange of or sale of energy to other persons only after notice and opportunity to the company for a hearing. Also, the company may appeal from the order to the Federal courts. Moreover, the Commission cannot issue the order if it would require the company to enlarge its generating capacity, would impair the company's ability to render adequate service to its customers or in any other respect would place an undue burden on the company.

3. It may fix rates, charges, regulations, etc., for any service subject to its jurisdiction; that is, interstate sale or transmission of energy (Section 206).

4. It may, upon application by a State Commission, require changes in the standards of interstate service rendered by the company (Section 207).

5. It may direct the company to carry depreciation accounts and fix the proper rates of such depreciation (Section 302). (Such an order may be issued only after giving the company an opportunity for a hearing, and is appealable to the Federal courts.)

6. It may determine the cost of the property of the company, the depreciation existing in such property and other facts bearing on its fair value. It may also require the company to supply it with an inventory of its properties, the original cost thereof, and to keep the Commission informed as to additions and betterments thereto.

7. It may make and prescribe the forms and methods of accounting to be followed by the company. If the Commission issues such an order or rule, the accounts and books can be kept only in the form prescribed by the Commission.

All of these regulatory matters are operative only after the Commission takes affirmative action and issues a rule, regulation or order. After such rule, regulation or order is issued, if it is within the power of the Commission under the Act, it has the same force and effect as if it constituted a part of the Act itself. However, until such order or rule is issued, none of the regulatory sections referred to require any change in the company's method of operation.

There are two limitations on the right of the Federal Power Commission to issue a rule, regulation or order with respect to any particular company. These limitations are both embraced in Section 318. They are *first*, that if without respect to the issue and sale of a security or the assumption of liability or the method and form of keeping accounts the company is subject to the provisions of Title I of the Act (because it is a registered holding company or a subsidiary of a registered holding company), then the Federal Power Commission has no jurisdiction to make any rule, regulation or order with respect to such matters. *Second*, if with respect to any requirement of Parts II and III of Title II the company is subject to the laws of a state or the regulation of a state Commission, then the Federal Power Commission has no authority to issue any rule, regulation or order with respect to such matters. Consequently, before the company applies to the Commission for its approval to the issuance of securities or complies with an order or rule of the Commission with respect to the keeping of accounts, it should first determine whether it is subject to similar regulation by the Securities and Exchange Commission under Title I of the Act; and before it complies with *any* requirement of the Act, whether by seeking the Commission's approval or by conforming to a rule or regulation of the Commission, it should determine whether it is subject to the laws of or regulations by a state with respect to the same matter. If so, then the Commission has no power to grant the approval or issue the rule or regulation.

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CONVENTIONS AND MEETINGS

JULY

1-6 Eighth Session of the Conference on Large High Tension Systems, Paris, France.

SEPTEMBER

3-6 Illuminating Engineering Society, Netherland Plaza Hotel, Cincinnati, Ohio.
4-6 Pennsylvania Electric Association, Bedford Springs, Pa.
18-28 National Electrical and Radio Exposition, Grand Central Palace, New York.
23-27 American Transit Association, Atlantic City, N. J.

OCTOBER

4-5 Empire State Gas and Electric Association, Westchester Country Club, Rye, N. Y.
7-11 National Electrical Manufacturers Association, Chicago, Ill.
14-17 American Gas Association, Palmer House, Chicago, Ill.

JANUARY, 1936

28-31 American Institute of Electrical Engineers, New York, N. Y.